

**DR.NAVALARNEDUNCHEZHIANCOLLEGE OF
ENGINEERING**

THOLUDUR - 606 303

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK – SIXTH SEMESTER

ANNA UNIVERSITY CHENNAI

Curriculum

B.E. MECHANICAL ENGINEERING

SEMESTER VI

S.No	Subject Code	Subject	L	T	P	C
THOERY						
1	MG 2351	Principles of Management	3	0	0	3
2	ME 2351	Gas Dynamics and Jet Propulsion	3	1	0	4
3	ME 2352	Design of Transmission Systems	3	1	0	4
4	ME 2354	Automobile Engineering	3	0	0	3
5	ME 2353	Finite Element Analysis	3	1	0	4
6	ME 2026	Unconventional Machining Processes	3	0	0	3
PRACTICAL						
7	ME 2355	Thermal Engineering Lab – II	0	0	3	2
8	ME 2356	Design & Fabrication Project	0	0	4	2
9	GE 2321	Communication Skills Lab	0	0	4	2
TOTAL			18	3	11	27

SEMESTER VI**MG2351 PRINCIPLES OF MANAGEMENT****L T P C****(COMMON TO ALL BRANCH****3 0 0 3****UNIT I OVERVIEW OF MANAGEMENT****9**

Organization – Management – Role of managers – Evolution of Management thought – Organization and the environmental factors – Managing globally – Strategies for International Business.

UNIT II PLANNING**9**

Nature and Purpose planning – Planning process – Types of plans – Objectives – Managing by objective (MBO) Strategies – Types of strategies – Policies – Decision Making – Types of decision – Decision Making Process - Rational Decision Making Process – Decision making under different conditions.

UNIT III ORGANISING**9**

Nature and purpose of organizing – Organization structure – Formal and informal groups organization – Line and Staff authority – Departmentation – Span of Control – Centralization and Decentralization – Delegation of authority – Staffing – Selection and Recruitment – Orientation Career Development – Career stages – Training – Performance Appraisal.

UNIT IV DIRECTING**9**

Creativity and Innovation – Motivation and Satisfaction – Motivation Theories Leadership – Leadership theories – Communication – Hurdles to effective communication – Organization Culture – Elements and types of culture – Managing cultural diversity

UNIT V CONTROLLING**9**

Process of controlling – Types of control – Budgetary and non-budgetary control techniques – Managing Productivity – Cost Control – Purchase Control – Maintenance Control – Quality Control – Planning operations.

TEXT BOOKS: TOTAL: 45 PERIODS

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W.L Hill, Steven L McShane, 'Principles of Management', McGraw Hill Education, Special Indian Edition, 2007.

REFERENCES:

1. Hellriegel, Slocum & Jackson, 'Management – A Competency Based Approach', Thomson South Western, 10th edition, 2007.
2. Harold Koontz, Heinz Weihrich and mark V Cannice, 'Management – A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th Edition, 2007.

ME2351 GAS DYNAMICS AND JET PROPULSION**L T P C**
3 1 0 4**AIM:**

To impart knowledge to the students on compressible flow through ducts, jet propulsion and space propulsion.

OBJECTIVE:

□ To understand the basic difference between incompressible and compressible flow. □ To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and Rocket Propulsion.

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS **6**

Energy and momentum equations of compressible fluid flows – Stagnation states, Mach waves and Mach cone – Effect of Mach number on compressibility – Isentropic flow through variable ducts – Nozzle and Diffusers – Use of Gas tables.

UNIT II FLOW THROUGH DUCTS **9**

Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties – Use of tables and charts – Generalised gas dynamics.

UNIT III NORMAL AND OBLIQUE SHOCKS **10**

Governing equations – Variation of flow parameters across the normal and oblique Shocks – Prandtl – Meyer relations – Use of table and charts – Applications.

UNIT IV JET PROPULSION **10**

Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operation principle, cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines.

UNIT V SPACE PROPULSION **10**

Types of rocket engines – Propellants-feeding systems – Ignition and combustion – Theory of rocket propulsion – Performance study – Staging – Terminal and characteristic velocity – Applications – space flights.

TEXT BOOKS:**TUTORIALS: 15, TOTAL: 60 PERIODS**

1. Anderson, J.D., Modern Compressible flow, McGraw Hill, 3rd Edition, 2003.
2. H. Cohen, G.E.C. Rogers and Saravanamutto, Gas Turbine Theory, Longman Group Ltd., 1980.
3. S.M. Yahya, fundamentals of Compressible Flow, New Age International (P) Limited, New Delhi, 1996.

REFERENCES:

1. P. Hill and C. Peterson, Mechanics and Thermodynamics of Propulsion, Addison – Wesley Publishing Company, 1992.
2. N.J. Zucrow, Aircraft and Missile Propulsion, vol.1 & II, John Wiley, 1975.
3. N.J. Zucrow, Principles of Jet Propulsion and Gas Turbines, John Wiley, New York, 1970.

4. G.P. Sutton, Rocket Propulsion Elements, John Wiley, 1986, New York.
5. A.H. Shapiro, Dynamics and Thermodynamics of Compressible fluid Flow, John Wiley, 1953, New York.
6. V. Ganesan, Gas Turbines, Tata McGraw Hill Publishing Co., New Delhi, 1999.
7. P.R.S.L. Somasundaram, Gas Dynamics and Jet Propulsions, New Age International Publishers, 1996.
8. V. Babu, Fundamentals of Gas Dynamics, ANE Books India, 2008.

ME2352 DESIGN OF TRANSMISSION SYSTEMS

L T P C
3 1 0 4

OBJECTIVE:

To gain knowledge on the principles and procedure for the design of power Transmission components. To understand the standard procedure available for Design of Transmission slip terms to learn to use standard data and catalogues

UNIT I DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS

12

Selection of V belts and pulleys – selection of Flat belts and pulleys - Wire ropes and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.

UNIT II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS

12

Gear Terminology-Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Module and Face width-power rating calculations based on strength and wear considerations - Parallel axis Helical Gears – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces and stresses. Estimating the size of the helical gears.

UNIT III BEVEL, WORM AND CROSS HELICAL GEARS

12

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears.

Worm Gear: Merits and demerits- terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair.

Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

UNIT IV DESIGN OF GEAR BOXES

12

Geometric progression - Standard step ratio - Ray diagram, kinematics layout - Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box.

UNIT V DESIGN OF CAM CLUTCHES AND BRAKES

12

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses.

Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches internal and external shoe brakes.

TUTORIALS: 15, TOTAL: 60 PERIODS

NOTE: (Usage of P.S.G Design Data Book is permitted in the University examination)

TEXT BOOKS:

1. Shigley J.E and Mischke C. R., “Mechanical Engineering Design”, Sixth Edition, Tata McGraw-Hill , 2003.
2. Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.

REFERENCES:

1. Maitra G.M., Prasad L.V., “Hand book of Mechanical Design”, II Edition, Tata McGraw-Hill, 1985.
2. Bhandari, V.B., “Design of Machine Elements”, Tata McGraw-Hill Publishing Company Ltd., 1994.
3. Prabhu. T.J., “Design of Transmission Elements”, Mani Offset, Chennai, 2000,
4. Hamrock B.J., Jacobson B., Schmid S.R., “Fundamentals of Machine Elements”, McGraw-Hill Book Co., 1999.
5. Ugural A,C, "Mechanical Design, An Integrated Approach", McGraw-Hill , 2003.

STANDARDS:

1. IS 4460: Parts 1 to 3 : 1995, Gears – Spur and Helical Gears – Calculation of Load Capacity.
2. IS 7443: 2002, Methods of Load Rating of Worm Gears
3. IS 15151: 2002, Belt Drives – Pulleys and V-Ribbed belts for Industrial applications –
PH, PJ, PK, Pl and PM Profiles: Dimensions
4. IS 2122 : Part 1: 1973, Code of practice for selection, storage, installation and Maintenance of belting for power transmission : Part 1 Flat Belt Drives.
5. IS 2122: Part 2: 1991, Code of practice for selection, storage, installation and Maintenance of belting for power transmission : Part 2 V-Belt Drives.

**ME2354 AUTOMOBILE ENGINEERING
COMMON TO MECHANICAL AND PRODUCTION**

**L T P C
3 0 0 3**

OBJECTIVE:

To understand the construction and working principle of various parts of an Automobile. To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I VEHICLE STRUCTURE AND ENGINES

9

Types of automobiles, vehicle construction and different layouts, chassis, frame and body, resistances to vehicle motion and need for a gearbox, components of engine-their forms, functions and materials

UNIT II ENGINE AUXILIARY SYSTEMS

9

Electronically controlled gasoline injection system for SI engines. Electronically

Controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system ,Turbo chargers, Engine emission control by three way catalytic converter system .

UNIT III TRANSMISSION SYSTEMS 9

Clutch-types and construction, gear boxes- manual and automatic, gear shift Mechanisms, over drive, transfer box, fluid flywheel –torque converter, propeller shaft, slip joints, universal joints, Differential, and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS 9

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System and Traction Control

UNIT V ALTERNATIVE ENERGY SOURCES 9

Use of Natural Gas, Liquefied Petroleum Gas. Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels – Electric and Hybrid Vehicles, Fuel Cell

Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

TEXT BOOKS:

TOTAL: 45 PERIODS

1. Kirpal Singh, “Automobile Engineering Vol 1 & 2 “, Standard Publishers, Seventh Edition, 1997, New Delhi
2. Jain,K.K.,and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers,New Delhi, 2002

REFERENCES:

1. Newton, Steeds and Garet,” Motor Vehicles “, Butterworth Publishers,1989
2. Joseph Heitner, “Automotive Mechanics,” Second Edition ,East-West Press ,1999
3. Martin W. Stockel and Martin T Stockle , “ Automotive Mechanics Fundamentals,” The Goodheart –Will Cox Company Inc, USA ,1978
4. Heinz Heisler , ‘Advanced Engine Technology,” SAE International Publications USA, 1998
5. Ganesan V.” Internal Combustion Engines”, Third Edition, Tata Mcgraw-Hill, 2007

ME2353 - FINITE ELEMENT ANALYSIS

L T P C

3 1 0 4

INTRODUCTION (Not for examination)

5

Solution to engineering problems – mathematical modeling – discrete and continuum Modeling – need for numerical methods of solution – relevance and scope of finite Element methods – engineering applications of FEA

UNIT I FINITE ELEMENT FORMULATION OF BOUNDARY VALUE PROBLEMS

5+3

Weighted residual methods –general weighted residual statement – weak formulation of the weighted residual statement –comparisons – piecewise continuous trial functions example of a bar finite element –functional and differential forms – principle of stationary total potential – Rayleigh Ritz method – piecewise continuous trial functions – finite element method – application to bar element

UNIT II ONE DIMENSIONAL FINITE ELEMENT ANALYSIS 8+4

General form of total potential for 1-D applications – generic form of finite element equations – linear bar element – quadratic element –nodal approximation – development of shape functions – element matrices and vectors – example problems – extension to plane truss– development of element equations – assembly – element connectivity – global equations – solution methods –beam element – nodal approximation – shape functions – element matrices and vectors – assembly – solution – example problems

UNIT III TWO DIMENSIONAL FINITE ELEMENT ANALYSIS 10+4

Introduction – approximation of geometry and field variable – 3 node triangular Elements – four noded rectangular elements – higher order elements – generalized coordinates approach to nodal approximations – difficulties – natural coordinates and coordinate transformations – triangular and quadrilateral elements – is-parametric elements – structural mechanics applications in 2-dimensions – elasticity equations – stress strain relations – plane problems of elasticity – element equations – assembly – need for quadrature formula – transformations to natural coordinates – Gaussian quadrature – example problems in plane stress, plane strain and ax symmetric applications

UNIT IV DYNAMIC ANALYSIS USING FINITE ELEMENT METHOD 8+4

Introduction – vibration problems – equations of motion based on weak form – longitudinal vibration of bars – transverse vibration of beams – consistent mass matrices – element equations –solution of eigen value problems – vector iteration methods – normal modes – transient vibrations – modeling of damping – mode superposition technique – direct integration methods

UNIT V APPLICATIONS IN HEAT TRANSFER & FLUID MECHANICS

6+3

One dimensional heat transfer element – application to one-dimensional heat transfer problems- scalar variable problems in 2-Dimensions – Applications to heat transfer in 2- Dimension – Application to problems in fluid mechanics in 2-D

TEXT BOOK:

L=42, T=18, TOTAL: 60 PERIODS

1. P.Seshu, “Text Book of Finite Element Analysis”, Prentice-Hall of India Pvt. Ltd. New Delhi, 2007. ISBN-978-203-2315-5

REFERENCE BOOKS:

1. J.N.Reddy, “An Introduction to the Finite Element Method”, McGraw-Hill International Editions (Engineering Mechanics Series), 1993. ISBN-0-07-051355-4
2. Chandrupatla & Belagundu, “Introduction to Finite Elements in Engineering”, 3rd Edition, Prentice-Hall of India, Eastern Economy Editions. ISBN-978-81-203-2106-9

3. David V.Hutton,"Fundamentals of Finite Element Analysis", Tata McGraw-Hill Edition 2005. ISBN-0-07-239536-2

4. Cook,Robert.D., Plesha,Michael.E & Witt,Robert.J. "Concepts and Applications of Finite Element Analysis",Wiley Student Edition, 2004. ISBN-10 81-265-1336-5

Note: L- no. of lectures/week, T- no. of tutorials per week

ME2026 UNCONVENTIONAL MACHINING PROCESSES L T P C
(COMMON TO MECHANICAL AND PRODUCTION) 3 0 0 3

OBJECTIVE:

To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

UNIT I INTRODUCTION

5

Unconventional machining Process – Need – classification – Brief overview.

UNIT II MECHANICAL ENERGY BASED PROCESSES 10

Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining. (AJM, WJM, AWJM and USM). Working Principles – equipment

used – Process parameters – MRR-Variation in techniques used – Applications.

UNIT III ELECTRICAL ENERGY BASED PROCESSES 8

Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool

Wear – Dielectric – Flushing – Wire cut EDM – Applications.

UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 12

Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants-maskanttechniques

of applying maskants-Process Parameters – Surface finish and MRR-Applications.

Principles of ECM-equipments-Surface Roughness and MRR- Electrical circuit-Process

Parameters-ECG and ECH - Applications.

UNIT V THERMAL ENERGY BASED PROCESSES 10

Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam

Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

TEXT BOOK: TOTAL: 45 PERIODS

1. Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd., New Delhi, 2007

REFERENCES:

1. Benedict. G.F. "Nontraditional Manufacturing Processes" Marcel Dekker Inc., New York (1987).

2. Pandey P.C. and Shan H.S. "Modern Machining Processes" Tata McGraw-Hill, New Delhi (2007).
3. Mc Geough, "Advanced Methods of Machining" Chapman and Hall, London (1998).
4. Paul De Garmo, J.T.Black, and Ronald.A.Kohser, "Material and Processes in Manufacturing" Prentice Hall of India Pvt. Ltd., New Delhi ,8th Edition, 2001.

SUBJECT CODE: MG1351

SUBJECT NAME: PRINCIPLES OF MANAGEMENT

UNIT – I HISTORICAL DEVELOPMENT

PART – A

(1 MARK)

1. **Henri fayol laid down**
 - a. 10 principles b. 12 principles c. 14 principles
2. **Esprit corps means**
 - a. Union is strength b. service is our motto c. buyer seware d. none of the above
3. **Which of the following is a major function of management?**
 - a. Planning b. organizing c. controlling d. all of the above.
4. **Which of the following contributed by F.W.Taylor?**
 - a. Principles of management b. scientific management c. theory of motivation.
5. **Management is**
 - a. An art b. science c. both
6. **Need based theory of motivation invented by**
 - a. MC Gregor b. Peter drucker c. Elton Mayo d. Maslow
7. **The first men who advocated the view that the management should can be target**
 - a. F.W.Taylor b. Peter drucker c. Hendry fayol
8. **Which of the following roles does not constitute management roles as proposed by Henry Mintzberg?**
 - a. Interpersonal role b. informational role c. decision role d. training role
9. **Which one of the following skill combinations is required for top management in descending order?**
 - a. Technical,human,conceptual b. Technical,human,conceptual c. Technical,human,conceptual
10. **A supervisor job is difficult because**
 - a. He is linking pin between management and operatives b. he has handle technical problems c. he has to deal with only un educated workers d. he is not well recognized kin of the organization
11. **Which one of the following approach has emerged from the findings of Hawthorne experiments?**
 - a. Human behavior approach b. system approach c. human relations approach d. decision theory approach
12. **Write one of the following is not associated with social responsibility?**
 - a. social commitment b. social concern c. social programme d. social structure
13. **Elton mayo is associated with**
 - a. 3d model b. Managerial grid c. Hawthorne studies d. none of the above
14. **The era is scientific management is**

- a. 1830 – 1880 b. 1880 – 1930 c. 1930 – 1980
- 15. responsibility is**
a. delegation of power b. power of commend c. obligation to do duty
- 16. Which one of the following can be delegated in management?**
a. authority b. responsibility c. none of the above
- 17. The number of persons reporting directly to a superior person is called**
a. communicating b. coordinating c. span of control
- 18. Top management functions are the most important because these take care of**
a. overall organization b. specific problems c. routine problems d. extraday problems
- 19. Bureaucracy is considered most efficient system because**
a. It insist in rules b. it prescribes informal relationships c. it emphasizes on human elements in the organization d. it provides more freedom to action
- 20. Business organization should feel concerned with social responsibility because they**
a. Are the part of society b. can make huge profit c. can be more efficient d. can compete in better way

1	2	3	4	5	6	7	8	9	10
c	a	d	b	c	d	b	b	b	b
11	12	13	14	15	16	17	18	19	20
c	d	c	b	c	a	c	a	a	a

PART – B**(2 MARK)****21. What is Management?**

Management is the process of giving direction and controlling the various activities of the people to achieve the objectives of an organization.

22. Define: Management (A.U-May'05)

According to Knootz and Wehrich “Management is the process of designing and maintaining of an environment in which individuals working together in groups efficiently accomplish selected aims”.

23. Write some characteristics of Management.

1) Management is a continuous process. 2) Managers use the resources of the organization both physical as well as human to achieve the goals. 3) Management aims act achieving the organization goals by ensuring effective use of resources.

24. What are the roles of management in organization?

1) Management helps indetermination of the objectives of an organization. 2) Economic and social development takes place through management.

25. Write any two points favors for management as a science.

1) Management principles should be verifiable. 2) Reliable basis for predicting future.

26. Write any two points favour for management as an art.

1) Management is creative. 2) Management includes the use of practical knowledge and personal skill.

27. Who is father of scientific management? [A.U- May'10]

Frederick Winslow Taylor.

- 28. What is Time study?**
The movement which takes minimum time is the best one.
- 29. What is motion study?**
Taylor suggested that eliminating wasteful movements and performing only necessary movements.
- 30. Write Faye's fourteen principles of management.**
1. Division of work 2. Authority and Responsibility 3. Discipline
4. Unity of command 5. Unity of direction 6. Individual interest to general interest 7. Remuneration 8. Centralization 9. Scalar chain 10. Order 11. Equity 12. Stability tenure of personnel 13. Initiative 14. Esprit de Corps.
- 31. What is authority?**
It is the power given to a person to get work from his subordinates.
- 32. What is responsibility?**
It is the amount of work expected of from a man by his superior.
- 33. Comment: Management is both – A science and an art.**
Management is a science because it contains general principles. It is also an art because it requires certain personal skills to achieve desired results.
- 34. What is centralization?**
The organization is centralized when the power is concentrated with one person.
- 35. What is decentralization?**
If the power is fully distributed to the subordinates of the organization.
- 36. What is scalar chain?**
The instructions and orders should be sent from the top management to the lower management.
- 37. What is Esprit-de-corps?**
This means union is strength. In organization employees should be harmony and unity.
- 38. What are management levels?**
(1) Top level management (2) Middle level management (3) Lower level management.
- 39. Write some important functions of top level management.**
(1) To formulate goals and policies of the company (2) to formulate budgets, (3) To appoint top executives.
- 40. Write any two functions of middle level management.**
(1) To train, motivate and develop supervisory level. (2) monitor and control the operations performance.
- 41. What are the essential skills needs for the managers?**
(1) Technical Skill (2) Human Skill (3) Conceptual Skill.
- 42. Write the functions of management.[AU. Nov/Dec.2011, May/June 2011, Nov/Dec 2011]**
(1) Planning (2) Organizing (3) Staffing (4) Coordinating (5) Controlling.
- 43. What is sole trading?**
Business unit which is owned and controlled by a single individual is known as a sole trading.
- 44. Define sole trade.**
The sole proprietorship is that form of business organization which is owned and controlled by a single individual.
- 45. Write any merits of sole trades.**
1. Liberal legal formalities to start the business 2. It is easy to formation.
- 46. Write ant two demerits of sole trading?**
1) Limited resources 2) Short life.
- 47. What is partnership?**

A partnership is an association of two or more persons to carry on business and to share its profit and losses.

48. Write any two merits of partnership?

1. Larger financial resources, 2. Promptness of decision-making.

49. Write any two demerits of partnership?

1. Lack of public faith, 2. Limitation in transfer in share.

50. What is joint Stock Company?

Joint Stock Company is association of many persons who contribute money worth to common stock and employing in source trade and also share the profit and losses.

51. What is private limited company?

A private limited company is a company which has a minimum paid up capital to be prescribed.

52. Write any two privileges a private ltd Company.

1. A private company can work with just directors. 2) It is not issuing prospective for collating its share capital.

53. What is a co-operative society?

It is a voluntary association of persons for mutual benefit and it aims is accomplished through self heap and collective effort.

54. Write any two merits of co-operative societies.

1. It is easy to formation 2. Low operator cost.

55. Write any two demerits of co-operative societies.

1. Lack of motivation, 2. No credit facilities.

56. Give an example of public corporation.

1. LIC 2. IDBI

57. Give an example of government companies.

1. Coal mines, 2. Tamilnadu state transport corporation.

58. What is a social responsibility?(AU-2004)

Society is the parts of the management to interact actions wither to protect social interest a society.

59. Distinguish between management and administration.(MAY/JUNE 2013)

Management is the function of executing the polices within the limits set up by the administration. it has the function of planning , organizing, directing and controlling. Administration is determinative and management is executive.

Administration is the overall determination of polices and major objectives. It aims for framing major polices, formulation of general procedure, listing out of the board programme and approval of major projects etc.

PART – C

(16 MARK)

60. Explain the principle of F.W. Taylor theory. [A.U-May'05]

61. Explain the Henry Fayol's management theory.[A.U-May'04,Dec'06,June'07,May'08 and May'10]

62. What are the major functions of management explain?

63. Indicate the three levels of management.

64. Explain management is an art or science both science and art. [A.U-Mar'10]

65. Describe social responsibilities of management.

66. Explain the importance of the management.

67. Explain the business organization. [AU-May'05]

68. Explain the types of business organization. [A.U-June'07,Mar'10, Nov/Dec 2011]

69. Explain the characteristics of sole trade.

70. Explain partnership.

71. Explain Joint Stock Company.
72. Explain limited company.
73. Write short notes on public corporation.
74. Describe whether management is a science or an art[AU' May' 10, Dec' 06]
75. Write an essay about the contributions made by F.W.Taylor, Henri Fayol, L.Gantt, Frank and Lillian Gilbreth, Groge, Elton Mayo and others to the field of Management[May' 08, Dec' 08]
76. a) Explain the principal contribution of H.Fayol to the development of management thoughts.
b) Compare and contrast between F.W.Taylor and H.Fayol's approach towards management.

UNIT – II PLANNING

PART – A

(1 MARK)

77. Which one of the following is not a planning premise
a. Internal b. controllable c. tangible d. remedial
78. Strategic planning as a broad concept consists of
a. Corporate strategy and business strategy b. strategy formulation and strategy implementation c. inputs and outputs d. environmental analysis and internal analysis
79. Some policies are imposed by external forces, such as
a. Government regulatory agencies b. employee demands c. managerial decisions d. lack of funding
80. Policies are sometimes defined as
a. Shortcut for thinking b. action plan c. substitute for strategy d. substitute for management authority
81. In developing planning premises factor which has high probability of impact and degree of impact is known as
a. high priority b. critical c. to be watched d. low priority
82. Which one of the following is not a forecasting technique?
a. Opinion poll b. econometrics c. regression analysis d. hunches
83. Sales forecasting is not related to estimating
a. Industry sales b. company sales c. territory sales d. sales performance
84. One of the major elements of planning process
a. Developing leadership qualities b. selecting right personnel c. perception of opportunities d. designing organization structure
85. Strategic planning differs from operational planning's strategic planning focuses on
a. Future course of action b. long term perspective c. short term perspective d. single use plans
86. Tactical planning is also known as
a. Strategic planning b. operational planning c. corporate planning d. proactive planning
87. Which one of the following elements is not a barrier to effective planning
a. Rapid environmental changes b. inadequate appreciation of planning c. organizational inflexibility d. social responsibility
88. MBO was introduced by
a. Taylor b. Mayo c. Peter Drucker d. none of the above
89. Specific and detailed guide to action is called
a. Rule b. procedure c. policy d. strategy
90. Delphi technique is associated with
a. Decision making b. planning c. coordination d. leadership
91. MBO denotes
a. Management by objectives b. management by objections c. management by orientations

92. Planning means the following

- a. Forecasting b. looking back c. departmentation

93. Which one of the following is a feature of a good plan?

- a. Consistency b. highly ambitious targets c. financial procedure d. rigid targets

94. Specific and detailed guide to action is called

- a. Rule b. procedure c. policy d. strategy

95. Pervasiveness of planning indicates that planning

- a. Extends throughout the organization b. is a top management function c. is the first element of management process d. is future oriented activity

96. Early theories about how individuals make decisions were based on the concept of a

- a. utilitarian philosophy b. action plan c. economic plan d. attentive man

77	78	79	80	81	82	83	84	85	86
b	b	a	a	b	D	d	c	b	a
87	88	89	90	91	92	93	94	95	96
d	c	b	a	a	b	a	b	a	c

PART – B**(2 MARK)****97. Define planning. [AU-Apr'04] [AU Apr 11][MAY/JUNE 2013]**

Planning is the process of selecting the objectives and determining the course of action required to achieve these objectives.

98. State the important observations suggested about planning.

- ❖ Planning is outlining a future course of action in order to achieve on objective.
- ❖ Planning is looking ahead.
- ❖ Planning is getting ready to do something tomorrow.
- ❖ Plan is a trap laid down to capture the future.

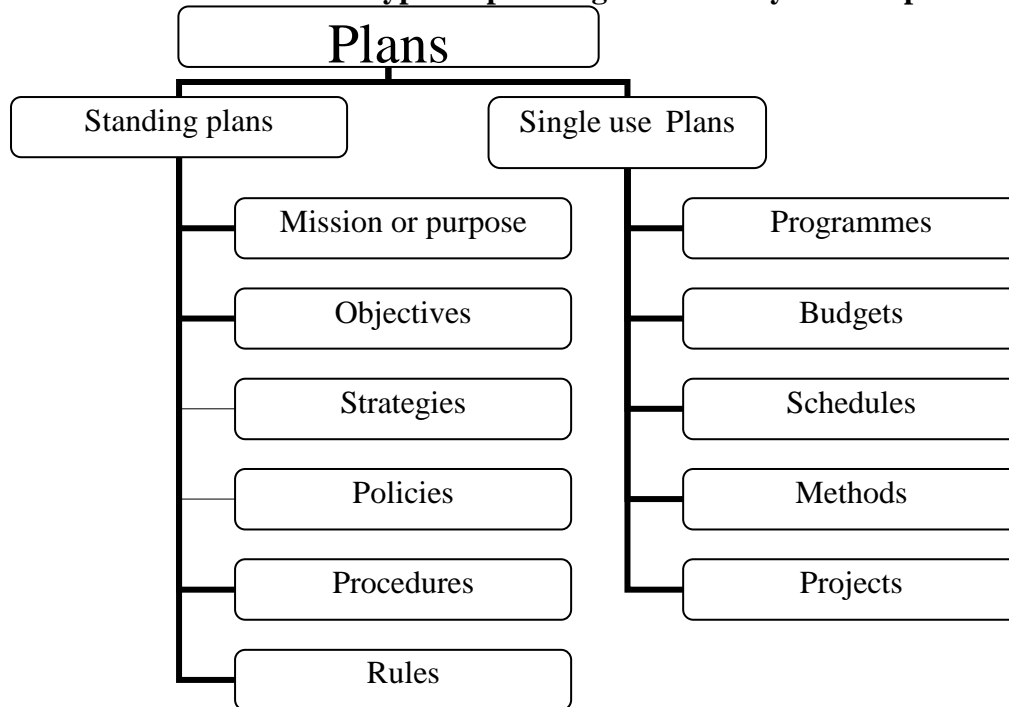
99. What are the objectives of planning? [AU-Dec'05]

- a. Planning is a primary function of an organization.
- b. It helps in achieving objectives.
- c. It is done to cope with uncertainty and change.
- d. It helps in facilitating control.
- e. It helps in coordination.
- f. Planning increases organizational effectiveness.
- g. Planning guides in decision making.

100. List out the features of planning.

- i) planning – a primary function
- ii) planning – a dynamic process
- iii) planning – based on objectives and policies
- iv) planning – a selective process
- v) pervasiveness of planning
- vi) planning – an intellectual process
- vii) planning is directed towards efficiently
- viii) Planning – focus with future activities.
- ix) flexibility of planning
- x) Planning is based on facts.
- xi)

101. What are the different types of planning? Or classify various plans. AU-Apr'04



102. Define “Mission”.

Mission may be defined as “ a statement which defines the role that an organization plays in the society”.

103. State the important question to answer by a good mission.

1. What is our business?
- 2) What should it be?

104. Define “objectives”.

The terms “objectives or “goals” are often used interchangeably. Objectives are the end results towards which the activities of firm are aimed or directed.

105. What is meant by strategy?

Strategy of an organization is the programmes of action and deployment of resources to attain its objectives.

106. What are the factors to be considered while formulating strategies?

- i. Mission and objectives of an organization.
- ii. Values, aspirations and prejudices of top level management.
- iii. Opportunities and threads of the external environment.
- iv. Strength and weakness of the firm in various aspects such as funds, organization structure, human talent, technology etc.

107. Define “policies”.

Policies are general statements or understandings which provide guidance in decision making to various managers.

108. Mention the required reasons for the need of policies.

- To ensure a uniform pattern of actions.
- To simplify and speed up the process of decision making.
- To secure coordination of efforts.

- To improve the performance of subordinates.

109. What is procedure?

Procedure is a chronological order or actions required to implement a policy and to achieve an objectives.

110. Name any two important procedures in organization.

- Procedures for placing orders for material and equipment.
- Procedures for sanctioning different types of employee's leave.

111. State any four advantages of procedures in planning.

- It avoids confusion and duplication by providing clear guidelines to action.
- It helps to improve performance by providing best and simplest way of performing a job.
- It brings uniformity in operations.
- It leads to simplification and elimination of unnecessary movements.
- It facilitates coordination between different work units.

112. How rules can be defined?

Rules are plans in which they suggest the required course of action.

113. What is programmed?

Programme is a broad term which includes goals, polices, procedure, rules, task assignment, steps to be taken, resources to be employed to carryout a given course of action.

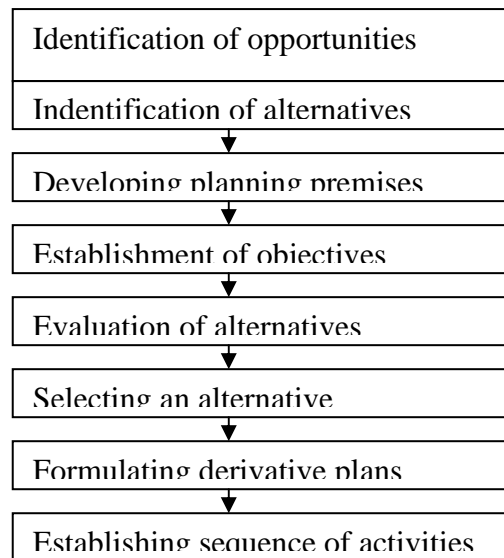
114. Define budgets.

A budget is a statement of expected results in numerical terms and therefore, it may be referred as a numerical programme.

115. Classify budgets.

1. variable budgets or Flexible budget:
 - These budgets vary according to the organization output.
2. Programme budgets
 - In this budget, the agency identifies goals, develops detailed programmes to meet the goals, and estimates the cost of each programme.
3. Zero-base budget
 - It is combination of programme and variable budget.

116. Give the flow diagram of planning steps.



117. What are the advantages of planning?

- i. It helps in achieving objectives
- ii. Better utilisation of resources
- iii. Economy in operation
- iv. It reduces uncertainty and risk
- v. It improves competitive strength
- vi. Effective control
- vii. Coordination
- viii. It encourages motivation

118. State any four limitations of planning.

1. Lack of accurate information,
2. Time and cost,
3. Inflexibility,
4. Delay during emergency period.

119. What is objective?

Objectives are the aims, purposes or goals that an organization wants to achieve over varying periods of time.

120. State the two approaches of objectives.

1. Top – down approach,
2. Bottom - up approach.

121. What are the advantages of objectives?

1. Unified planning
2. Defining an organization
3. Direction
4. Individual motivation
5. Basis for decentralization
6. Basis for control
7. Co-ordination

122. List down the guidelines for objectives setting.

- i. Objective should cover the main features of the job.
- ii. Objectives must be clearly specified in writing.
- iii. The list of objectives should not be too long. Wherever it is possible, combine some objectives to make the list reasonable.
- iv. Objectives must set by considering the various factors affecting their achievement.
- v. Objectives should be verifiable.

- vi. Objectives should clearly indicate the organizational mission.
- vii. Objectives should be challenging and reasonable.
- viii. Objectives should yield specific results when achieved.
- ix. Objectives should be coordinated with these of other managers and organizational units.
- x. Objectives should provide timely feedback so that the necessary corrective action can be taken.
- xi. Short-term objectives should be consistent with long-term objectives.
- xii. Objectives should start with the word 'to' and be followed by an action.
- xiii. Objectives should be periodically reviewed.
- xiv. Objectives should clearly indicate the resources and authority required for achieving it.
- xv. All the assumptions underlying the objectives are clearly identified.

123. What are the demands that should be met by the selective objectives?

- i) Objectives should be consistent with the values of the management in the organization.
- ii) Objectives should pin-point the organizational strengths and weakness.
- iii) Objectives must satisfy the external environmental forces.

124. Mention the different areas of an organization towards objective setting.

1. Market standing, 2. Innovation, 3. Productivity, 4. Resources-Physical and financial, 5. Profitability, 6. Manager performance and development, 7. Worker performance, attitude and development, 8. public responsibility.

125. What are the benefits of objective setting?

1. It sets specific targets for the employee to achieve which are linked to Business / Development Plan.
2. It states how the performance of the employee is to be measured to assess progress.
3. It provides the direction for the employee.
4. It allows progress, targets and successes to be monitored and measured by the manager.
5. It helps build working relationships between the employee and the manger, and improves overall communications.
6. It helps to focus on a specific task.
7. It increases staff motivation
8. It helps to Priorities
9. It allows reviews to be undertaken.
10. It enables success to be measured.

126. Tabulate the steps to be kept in mind while writing objectives.

CHECK THESE STEPS HAVE BEEN UNDERTAKEN	IMPLICATION IF NOT DONE
Are the objectives linked to the Business / Development plan?	Will not assist in achieving overall goals.
Have the objectives been mutually agreed after consultation?	Employee needs to take ownership of objectives
Is the wording clear and concise?	Easier to understand & measure
Are the SMART objectives?	Ensures the objectives can be used constructively.
The objective should clearly identify the measurable factors such as cost, time, and volume	Will be able to identify progress and whether they have been achieved.
Are they prioritized?	Ensures that time is spent on the most crucial areas first.

Are the objectives being used?	Otherwise it may demotivate employee
Are the monitored regularly?	To provide feedback on progress
Were any changes agreed?	Employee to take ownership of objectives.
Does each objective contain a single action or activity?	To identify what needs to be done.

127. What is MBO? [Nov/Dec 2011]

MBO is a process whereby the superior and the subordinate managers of an enterprise jointly identify its common goals, define each individual's major areas of responsibility in terms of results expected of him, and use these measures as guides for operating the unit and the contribution of each of its members is assessed.

128. Mention any four features of MBO.

- MBO focuses attention on what must be accomplished and not how to accomplish the objective. It is a goal oriented rather than work-oriented approach.
- It is an attempt made by the management to integrate the goals of an organization and individuals. It will lead to effective management.
- MBO tries to combine the long range goals of organization with short range of organization.
- MBO involves participation of subordinate managers in the goal setting process.
- A high degree of motivation and satisfaction is available to employees through MBO.

129. What are the steps involved in MBO process?

- Setting preliminary objectives
- Fixing key result areas
- Setting subordinate's objective
- Recycling objectives
- Matching resources with objectives
- Periodic performance reviews
- appraisal

130. What are the benefits of MBO?

- Improvement of managing
- Clarification of organization
- Personnel satisfaction
- Team work
- Development of effective control
- Fast decision making

131. Note down the weakness of MBO.

- Failure to teach the philosophy of MBO.
- Failure to give guidelines to goals setters
- Difficulty of setting goals
- Emphasis on short-term goals
- Danger of inflexibility
- Time consuming
- Increased paper work

132. What is meant by "strategy"?

A strategy may also be defined as a special type of plan prepared for meeting the challenge posted by the activities of competitors and other environmental forces.

133. State any four features of strategy.

- a. Strategy relates an organization to its environment, particularly the external environment. Strategic decisions such as objective setting, actions and resources required to achieve objectives are primarily concerned with external forces.
- b. Strategy is the right combination of both internal and external factors. By considering external factors, it should also consider internal factors such as strength and weakness to take various course of action.
- c. Strategy is a contingent plan as it is designed to meet the demands of a particular situation.
- d. Strategy may involve contradictory action. For example, a manager may take an action today and may revise his action tomorrow due to change in the situation.

134. State the need and importance of strategies.

- a. Strategy of an organization is very helpful for facing environmental challenges. While formulating strategies, an organization identifies threatens and opportunities posed by the likely future environment.³
- b. Strategy provides a long-term guide towards the achievement of objectives.
- c. Strategy ensures more efficient and effective utilization of organizational resources. Example time, money, man power, machine etc.
- d. It integrates the different departments and groups of the organization. Hence, it facilitates better coordination and control.

135. What are the major kinds of strategies and polices?

1. Growth, 2. Finance, 3. Organization, 4. Personnel, 5. Products or Services, 6. Market.

136. Write down any four factors which lead to fail of strategic planning.

1. Managers are inadequately prepared for strategic planning.
2. The information for preparing the plans is insufficient for planning for action.
3. The goals of the organization are too vague.
4. The business units are not clearly identified.

137. State the eight important recommendations should be considered for the success of implementing strategies.

1. Communication of strategies
2. Developing and communicating planning premises
3. Developing appropriate operational plans
4. Periodic review of strategy
5. Developing contingency strategies and programmes
6. Developing appropriate organization structure
7. Continuing to emphasize planning an implementing strategy
8. Setting proper organizational climate.

138. Mention the sound policy characteristics.

- Relationship to organizational objectives.
- Clarity of policy
- A policy is a guide to thinking in decision making
- Policies should be written
- Communication of policies
- Consistency of policies
- Balance of policy
- Planned formulation

139. What are the processes involved in policy formulating process?

- ☞ Definition of policy area
- ☞ Creation of policy alternatives
- ☞ Evaluation of policy alternatives

- ☞ Choice of policy
- ☞ Communication of policy
- ☞ Implementation of policy
- ☞ Review of policy

140. Classify policies.

- ☞ Formulated policies
- ☞ Appealed policy
- ☞ Imposed policy
- ☞ Written policies
- ☞ Implied policies

141. What is planning premises?

The assumptions about future derived from forecasting and used in planning are known as planning premises.

142. State the classification of planning premises.

- ☞ Internal and External
- ☞ Tangible and intangible
- ☞ Controllable and uncontrollable

143. What are the practices made in making effective premising?

- ☞ Selection of premises
- ☞ Collection of information
- ☞ Development of alternative premises for contingency planning
- ☞ Verification of the consistency of premises
- ☞ Communication of planning premises

144. Explain the term decision and decision making.[AU-Apr'04]

A decision may be a direction to other to do or not to do. Decision-making is defined as the process of choosing a course of action from among alternatives to achieve a desired goal. It is one of the functions of management and also a core process of planning. The management executive takes a number of decisions every day. Thus, a decision may be rational or irrational. There are number of alternatives available to the management. The best one is selected out of the available alternatives.

145. How would you evaluate the importance of a decision?

- i. Decision making is a selection process. The best alternative is selected out of many available alternatives.
- ii. Decision-making is a goal-oriented process. Decisions are made to achieve some goal or objective.
- iii. Decision making is the end process. It is preceded by detailed discussion and selection of alternatives.
- iv. Decision making is a human and rational process involving the application or intellectual abilities. It involves deep thinking and foreseeing things.
- v. Decision making is a dynamic process. An individual takes a number of decisions each day.

146. Mention the three approaches generally adopted by managers in selecting an alternative. Or what are the techniques useful while evaluating alternatives? AU-Apr'05)

- Quantitative and Qualitative analysis
- Marginal analysis
- Cost effectiveness analysis

147. What is strategic planning?

Strategic planning is a process of examining the external and internal factors involved in an organization in order to formulate the objectives, policies, plans and programmes etc.,

PART – C**(16 MARK)**

148. Describe the various elements in planning. [AU-Apr'04]
149. What are the different types of plans? Explain. [AU-Nov'04]
150. Give an account of various steps involved in planning. (or) Explain with flow diagram the steps in planning. [AU-Apr'05, Dec'06, June'07 and May'10] {MAY/JUNE 2013}
151. Describe the different objectives of planning. [AU-Apr'04]
152. Mention advantages and limitations of planning. [AU-May'10]
153. Explain briefly the benefits and weakness of MBO. [AU-Nov'04 and Apr'05]
154. State and explain the eight recommendations that should be considered by managers for successful implementation of strategies. [AU-Apr'05]
155. Discuss the factors for strategies policies and planning premises. [AU-Nov'05] MAY/JUNE 2013]
156. Describe the various types of decision. [AU-Apr'04]
157. Describe the steps in rational decision making. [AU-Apr'04] [MAY/JUNE 2013]
158. Explain modern approaches to decision making under uncertainty. [AU-Nov'04]
159. Write short notes on any two important modern approaches to decision making under uncertainty. [AU-Apr'05]
- 160.
161. Define decision making and explain the process of decision making that affects the efficiency of the business decision. [AU-Nov'05]
162. Explain in detail the process of managerial decision making. [A.U-Nov'08, May'08]
163. Explain the various elements of forecasting process. [A.U-May'10]
164. Define Forecasting. Explain the various forecasting techniques used for decision making process [A.U-June'07]
165. Discuss tangible and intangible factors relevant to decision making [Au-May'10]
166. Explain in detail the importance of planning and about the various types of plans.
167. How will you set the objectives for a manufacturing organization?

UNIT – III ORGANISING**PART – A****(1 MARK)**

168. **The term organization is used in many ways except the following one:**
a. As entity b. as process c. as group of people d. as production process
169. **Organizing process does not involve one of the following elements**
a. departmentation b. delegation of authority c. fixing responsibility d. appraisal of subordinate
170. **Which one of the following factors is not important in organization design?**
a. Environment b. strategy c. information relationships d. technology
171. **For which of the situations, is line organization structure suitable?**
a. Highly diversified organization b. small organization c. organization with many projects d. large organization
172. **From which combination, is a matrix structure created?**
a. Functional and divisional b. functional and project c. functional and line d. divisional and line
173. **In which type of organization structure is line and staff authority relationship prevalent.**
a. Virtual organization b. functional organization c. task force d. committee
174. **Staff authority works as**
a. Chain of command b. channel of communication c. carrier responsibility d. advice on certain matters

175. Line and staff conflict can be overcome by

- a. Congenial organizational climate b. avoiding appointment of staff personnel b. making line managers more responsible d. giving complete authority to staff over line managers

176. Which one of these is not a source of authority

- a. Organizational position b. competence a person c. acceptance by subordinates d. extra organizational relation

177. Which one of these can be delegated?

- a. Power b. authority c. responsibility d. accountability

178. Degree of centralization indicates,

- a. Degree of delegation authority b. degree of responsibility c. degree of power d. degree of accountability

179. Which one of the following is not a technique for co-ordination

- a. Leadership b. staff meeting c. committee d. conflict resolution

180. In staff function, which one of the following group of managers is involved?

- a. Only top management b. only middle managers c. job planning d. manpower inventory planning

181. Which one of the following elements is not a part of job analysis

- a. Defining uses of job analysis b. information collection for job analysis c. information processing for job analysis d. determining relative worth of the jobs

182. A job description provides information about,

- a. Nature and characteristics of job b. characteristics of the person performing the job c. characteristics of the organization d. inventory development

183. Job rotation involves

- a. Moving a person from one job to another job b. making a job more motivating c. enlarging the activities involved in the job d. upgrading the job to a higher rank

184. Which one of the following sources is most relevant for recruiting managerial personnel?

- a. Employment exchange b. advertisement c. gate hiring d. trade unions

185. A stress interview is also known as

- a. Patterned interview b. directive interview c. non directive interview d. none of these

186. Oldest form of organization

- a. Line b. functional c. line and staff d. none of these

187. Staff function is

- a. Advisory function b. production function c. policy making function d. none of the above

168	169	170	171	172	173	174	175	176	177
d	d	a	d	b	b	b	a	d	C
178	179	180	181	182	183	184	185	186	187
a	b	b	d	a	a	b	a	a	d

PART – B**(2 MARK)****188. Define Organizing. [AU-MAY'10]**

Organizing is the process of identifying and grouping of activities required to attain the objectives, delegating authority, creating the responsibility and establishing relationships for the people to work effectively.

189. What do you understand by effective organizing?[AU-Nov'05] [AU Apr011]

Effective organizing focuses on finding mistakes in present organizing and avoiding such mistakes by proper planning. Effective organizing avoids organizational inflexibility and makes the staff work effectively by avoiding conflicts by clarification.

190. Mention any four characteristics of an organization.

1. Common objectives,
2. Specialization or Division of labour,
3. Authority of structure,
4. Group of persons.

191. State the advantages of organization.

1. It facilitates administration
2. It increases the efficiency of management
3. It facilitates growth and diversification
4. It ensures optimum use of man and material resources

192. List out the steps involved in organization process.

1. Determination of activities,
2. Grouping of activities,
3. Assignment of Duties,
4. Delegation of authority.

193. Mention the various principles involved in organization.

1. Principle of unity of objective
2. Principle of division of work or specialization
3. Principle of efficiency
4. Principle of span of control

194. Note down the important characteristics of formal organization.

- It is flexible and properly planned
- It is based on principle of division of labour and efficiency in operations
- It concentrated more on the performance of jobs and not on the individuals performing the jobs.
- Organization charts are usually drawn.

195. How informal organization characteristics differ from format organization?

- It arises with out any external cause ie. Voluntarily. It is a natural outcome at the work place.
- It is created on the basis of some similarity among the members. The bases of similarity may be age, sex, place of birth, caste, religion, liking/disliking etc.
- Informal organization has no place in the organization chart.
- It is one of the parts of total organization.

196. State the kinds of organizational charts.

- Vertical chart
- Horizontal chart of left to right chart
- Circular chart or concentric chart

197. Distinguish between formal and informal organization. [AU-Apr'04,May'10]

Sl.	Point of view	Formal organization	Informal organization
1	Origin	It is created deliberately and consciously by the frames of the organization	It is created spontaneously and naturally.
2	Purpose	It is created for achieving legitimate objectives of the organization	It is created by the members of the organization for social and psychological satisfaction.
3	Nature	Planned and official	Unplanned and unofficial
4	Size	It may quite large	It may be small in size

198. Enumerate the advantages of functional organization grouping. [AU-Apr'05]

1. Since a foreman is responsible for one function, he can perform his duties in a better manner.
2. This organization structure makes use of specialists to give expert advice to workers.
3. It relieves line executives of routine, specialized decisions which are sometime bore some.
4. Expert guideline reduces the number of accidents and wastages materials, man and machine hours.
5. It relieves pressure of need to search a large number of all-round executives.

199. What is span of control? [AU-Apr'04]

Span of control means the number of people managed effectively by a single superior in an organization. The term "Span of control" is also known as "Span of management", "Span of authority" and "Span of responsibility". But span of management is a better term because control and supervision are elements of management.

200. Mention the three categories of span of management.

1. Direct single relationship,
2. Direct group relationship,
3. Cross relationship

201. State the important factors in determining an effective span.

1. Capacity of superior,
2. Capacity of subordinates,
3. Nature of work,
4. Type of technology,
5. Delegation of authority.

202. What are the types of departmentation?

1. Departmentation by numbers
2. Departmentation by time.
3. Departmentation by Enterprise function
4. Departmentation by Territory or Geography
5. Departmentation by Customers
6. Departmentation by equipment or process
7. Departmentation by product or service.

203. What is a matrix structure?

Matrix structure is a hybrid organizational form, containing characteristics of both project and functional structures.

204. How can we define power?

"Power is the probability that one actor within the relationship will be in a position to carry out his own despite resistance".

205. Compare line and staff authority.

Sl	Line authority	Staff authority
1	It has right to decide or command	It has right to provide advice, assistance and information
2	It contributes directly to attainment of organizational objectives.	It assists line in effective attainment of objectives.
3	It creates superior-subordinate relations.	Extension of line and supports line.
4	It flows from top to downward. i.e. superior to subordinate.	It flows in any direction depending upon the situation.

206. What are the advantages of decentralization? [AU-Apr'04] [MAY/JUNE 2013]

- It reduces burden of the management so that it can focus more
- Attention on strategic management
- It encourages decision making and assumption of authority and responsibility.
- It facilitates growth and diversification in the organization.
- It enables the department staff members to complete work early.

207. Define staffing.

Staffing is the part of the management process which is concerned with the procurement utilization, maintenance and development of a large satisfied work force on the organization.

208. What is job analysis?

Job analysis is a detailed study of a job to identify the skills, experience and aptitude required for the job.

209. Distinguish between job description and job specification.

Job description is a written statement showing job title, tasks duties and responsibilities involved in a job.

Job specification also known as man or employee. Specification is a statement of minimum acceptable qualities required in a job incumbent for the effective performance of the job.

210. What is job design?

The job design is usually broad enough to accommodate people's need and desires.

211. What is job rotation?

Job rotation refers in the movement of an employee from the job to another.

212. What are the sources of recruitment?

Internal sources: 1. promotion, 2. present casual employees, 3. retired employees.

External sources: 1. public employment exchange, 2. data banks, 3. casual applicants.

213. Write the differences between recruitment and selection.

SL.	Recruitment	Selection
1	It is one step process.	It involves several steps.
2	It is only finding, developing the sources of employees attraction hem to apply for jobs.	It is due process of finding out the suitable to the job out of the recruitment.
3	It is initial step of the organization	It is final step of the organization.

214. Write down the tests used in selection process

1. Aptitude test, 2. Intelligence test, 3. Psychomotor test, 4. Personality test.

215. What is Halo effect?

It is the tendency of the rater to depend excessively on the rating of one. Trait or behavioral consideration in rating all other traits or behavioural considerations.

216. What is management by objectives? [AU. Nov/Dec. 2011]

MBO is a process where by the superior and subordinate managers of an organization jointly identify its common goals.

217. What are the main objectives of HRA?

- Determination of asset control i.e. whether human assets are to develop, allocate, evaluate or reward.
- To assist in the development of effective management.

218. List out the physical sources of stress.

1. Work overload, 2. Loss of sleep, 3. Loud noises.

219. What are the methods of on the job training?

1. Job rotation, 2. Apprenticeship and coaching, 3. Committee assignments, 4. Experience, 5. Temporary promotions.

220. What are the methods of off the job training method?

1. Lecture, 2. Seminars, 3. Case studies, 4. Business game, 5. In basket method, 6. Sensitivity training.

221. What is T-Group training?

In this method a small group meets in an unstructured problem. Under this training the different groups of trainees are allowed to mix up each other and communicate with each other freely to try to solve the problems.

222. What is organizational change?

The term change refers to an alteration in a system whether physical, biological or social. Thus organizational change is the alteration of work environment in organization.

223. What is unfreezing?

Unfreezing creates motivation for change. If people feel uncomfortable with the present situation they may be used for change.

224. Define: Organizational conflict.

According to steps "conflict is a process in which an effort is purposefully made by one person or unit to block another that results in frustrating the attainment of others goals of the furthering of his or her interests.

225. What is O.D.?

Organization development is a systematic and continuous process of learning and growth. O.D. is an educational strategy which focuses on the whole culture of the organization in order to bring about planned change.

226. What is managerial grid?

Managerial grid is behavioral theory of leadership. It plays an important role in managerial behavior in organizational development.

227. What is the purpose of HRM? [AU-Dec'05]

1. Recruitment,
2. Selection,
3. Training,
4. Appraisal process.

228. Why is informal organization needed?

1. Informal organization gives satisfaction to the workers and maintains the stability of the work.
2. It is a useful channel of communication.
3. The informal organization also fills up the gaps among the abilities of the managers.

229. What is organizational structure?

It is the network of jobs, flow of authority, roles and relationship for achieving the goals of the organization.

PART – C**(16 MARK)**

230. Explain the nature and purpose of an organization. [A.U.Dec'06]

231. Explain the principles of organization.

232. Explain the characteristics and limitations of formal organization.

233. Discuss the merits and demerits of a line and staff organization with examples [A.U-June'07]

234. Give a brief account of at least six mistakes in organizing. [AU-Apr'05]

235. Explain how formal organization is different from informal organization illustrate. [AU-Nov'04,Dec'08,May'08] [MAY/JUNE 2013]

236. How does a leader influence organization culture? [A.U-Nov'04]

237. Discuss about the factors determining an effective span of management. [AU-Apr'05]

238. Explain the various types of staff [Au-May'10]

239. Describe departmentation by process. What are its advantages and disadvantages? [A.U-Apr'04,June'07] [MAY/JUNE 2013]

240. Explain the line organization with a neat sketch. [A.U-Nov'05]

241. Explain the concept of functional authority. How do you delegate it? [AU-Nov'04]

242. Explain the concept of decentralization. [A.U-Nov'05, May'10]

243. Briefly explain the factors determining the degree of decentralization of authority. [A.U-Apr'05]

244. Explain advantages and disadvantages of manager inventory chart.

245. Discuss the major tests that used in selection. What are the benefits and problems in using selection tests. [Au-May'10]

246. Evaluate the advantages and disadvantages of on-the-job training.

247. Explain in detail the various types of conflict. Give examples that are relevant to each type of conflict.
248. Discuss the conflict resolution techniques what are the strengths and weaknesses of each.
249. Explain the role and characteristics of OD.
250. What is an expert system and how can it help managers make decisions.
251. Explain organization development process.
252. Name the factors determining departmentation. Mention the bases of departmentation and give examples.
253. Explain the various steps in staff selection process. [MAY/JUNE 2013]

UNIT – IV DIRECTING

PART – A

(1 MARK)

254. According to Herzberg, which of the following is a maintenance factor?
a. Salary b. work itself c. responsibility d. recognition
255. According to Abraham Maslow, the most elevated type of need is
a. Safety b. esteem c. self – actualization d. physiological e. social
256. Which one of the following theories is a process theory of motivation?
a. Maslow’s need hierarchy b. vroom’s valence expectancy c. motivation – hygiene d. equity theory
257. According to Maslow’s need hierarchy theory, which of the following sequence is correct?
a. physiological, safety, social, esteem, self- actualization
b. safety, social, esteem, physiological, self- actualization
c. self- actualization , safety, esteem, social, physiological
d. physiological, safety, esteem, social, self- actualization
258. Which one of the following aspects of managing has not been emphasized by McGregor’s theories X and Y?
a. planning b. organizing c. directing d. appraising
259. Which one of the following is not a form of autocratic leader?
a. strict b. benevolent c. incompetent d. free-rein
260. Managerial grid has been developed by
a. Blake and mounon b. w.J.Reddin c. rensis Likert d. Elton Mayo
261. Communication begins with
a. encoding b. idea generation c. decoding d. channel selection
262. Which one of the following is not an element of communication process?
a. encoding b. channel c. Receiver d. Measurement
263. On which form of communication do managers spend maximum time
a. oral communication b. written communication c. Non-verbal communication d. pictorial communication
264. Grapevine is a type of
a. informal communication b. formal communication c. written communication d. pictorial communication
265. Which one of the following is not an element of direction?
a. guiding employees b .instructing employees c. motivating employees d. controlling employees
266. Which one of the following principles is related to purpose of directing?

- a. unity of command b. Managerial communication c. maximum individual contribution
d. principle of leadership
- 267. Which one of the following is not an element of empowerment?**
a. delegation of authority b. goal setting c. self – management d. control mechanism
- 268. Which one of these is used for motivation?**
a. job simplification b. job rotation c. job enlargement d. job enrichment
- 269. Which one of the following factors is used improving quality of work life?**
a. flexible work schedule b. tall organization structure c. tight work schedule d. financial incentives
- 270. Which one of the following is not in indicator of status of morale?**
a. Employees absenteeism b. employees’ turnover c. job satisfaction d. promotion
- 271. The concept of power refers to**
a. defined authority and responsibility b. a relative hierarchical position in an organization c. the ability to influence the behavior of others d. the specialized knowledge possessed by an individual
- 272. Which one of the following is not a method of job evaluation?**
a. Ranking method b. point method c. grading method d. field review method
- 273. on which type of leadership, has the recent emphasis been put?**
a. transformational leadership b. transactional leadership c. autocratic leadership d. informal leadership

254	255	256	257	258	259	260	261	262	263
d	c	d	a	a	d	a	b	b	a
264	265	266	267	268	269	270	271	272	273
a	d	d	b	b	a	d	c	d	B

PART – B**(2 MARK)****274. What is meant by the term directing?**

Directing may be defined as the process of instructing, guiding and inspiring human factors in the organization to achieve organization objectives. It is not only issuing orders and instruction by a superior to his subordinates but also including the process of guiding and inspiring them to work effectively.

275. Define creativity. [MAY/JUNE 2013]

Creativity is defined as the ability to produce new and useful ideas through the combination of known principles and components in novel and non obvious ways. Creativity exists throughout the population, largely independent of age, sex, and education.

276. What does SCAMPER stand for?

- S- substitute -components, materials, people
- C- combine-mix, combine with other assemblies or services, integrate
- A- adapt – alter, change function, use part of another element
- M – modify – increase or reduce in scale, change shape, modify attributes (e.g. color)
- P- put to another use
- E – eliminate – remove elements, simplify, reduce to core functionality
- R – reverse – turn inside out or upside down, also use of reversal.

277. Define: Innovation. [AU-MAY’10] [MAY/JUNE 2013]

Innovation means the use of creative ideas.

278. Define “multiplicity of roles”.

Individuals are not only the productive factor in management’s plans. They are members of social system of many organizations.

279. What is meant by Brain Storming? [AU-Nov’04]

Brainstorming is a excellent way of developing many creative solutions to a problem. It works by focusing on a problem, and then coming up with very many radical solutions to it. The essence of brainstorming is a creative conference, ideally of 8 to 12 people meeting for less than an hour to develop a long list of 50 or more ideas. Suggestions are listed without criticism on a blackboard or newsprint as they are offered; one visible idea leads to others. At the end of this session, participants are asked how the ideas could be combined or improved.

280. Compare theory X and theory Y.

Sl.	Theory X	Theory Y
1	The average human dislikes work	Work is as natural as play or rest.
2	People are unambitious and prefer to be directed by other.	Ambitious and capable of directing their own.
3	They avoid responsibility.	They accept responsibility under proper conditions.
4	External control, threatening and close supervision are required.	Self directed and self are controlled.

281. Define motivation. [AU-Nov’05]

According to Koontz and O’Donnell, “Motivation is a general term applying to the entire class of drives, desires, needs withes and similar forces that induce an individual or a group of people to work”.

Scott defines, “Motivation means a process of stimulating people in action to accomplish desired goals”.

282. What are the types of motivation?

1. Positive motivation, 2. Negative motivation, 3. Extrinsic motivation, 4. intrinsic motivation.

283. Distinguish between motivation and satisfaction. [AU-Apr’05]

Motivation:

Management is the art of getting workdone by the subordinates in order to attain common goals of the organization. Getting workdone is a difficult task.

Satisfaction:

After attaining the goals, everyone involved in the same gets happiness or internal feelings.

So, motivation is before attaining the specific task but satisfaction means, the happiness comes after attaining the goals.

284. List out the basic needs in a hierarchy.

1. Physiological needs, 2. Safety needs, 3.Social needs, 4.Esteem needs, 5. Self-actualization needs

285. Mention the various factors involved in using motivational techniques.

1. Money, 2. Participation, 3. Quality of working life.

286. What is job enrichment?[MAY/JUNE 2013]

Job enrichment is therefore based on the assumptions that in order to motivate personnel, the job itself must provide opportunities for achievement, recognition, responsibility, advancement and growth.

287. Define leadership.

Leadership is the process of influencing the behaviour of others towards the accomplishment of goals in a given situation.

288. Mention the importance of leadership.

1. motivating employees, 2. leader develops team work, 3. better utilization of manpower, 4. creating confidence of followers, 5. directing group activities, 6. building morale, 7. maintaining discipline.

289. List of few leadership traits. [AU-Nov'04]

1. the Michigan studies, 2. The Ohio state university studies, 3. the managerial grid.

290. What are the four basic ingredients of leadership skill?[AU-Apr'05] OR Mention any two leadership qualities. [AU-Nov'05]

- i) Physical qualities: Sound health, vitality, appearance, physical and nervous energy, forcefulness, physique, enthusiasm.
- ii) Intellectual qualities: High intelligence, sound judgment ability to teach, scientific approach, decisiveness, self understanding.
- iii) Morale qualities: Integrity, moral courage, fair play, will power, sense of purpose, objectivity.
- iv) Social qualities: Ability to inspire, tact, percussiveness, self-confidence, empathy, initiative, knowledge of human nature human relations attitude.

291. Name the various types of communication.[AU-Apr'04]

1. Downward communications, 2. upward communication, 3. horizontal or lateral communication.

292. Differentiate single and multiple channel networks.

Sl. No.	Single channel communication	Multiple channel communication
1	The communication is allowed on only one path called as line authority. It is simply referred as through proper channel.	The communication is allowed in more than one path.
2	Communication flow is slow	Communication flow is faster,
3	Easy to maintain orderly in nature.	Potential problems may occur.
4	Miscommunication reduced.	Miscommunication is increased.

293. List out the various effective media in communication.[AU, Apr11]

1. A large bank supplies hardware and software to its customers.
2. several banks now make bank-by – phone services available even to individuals.
3. E-mail service making easy delivery of documents.

294. Distinguish between a leader and manager.

Leadership is generally defined as influence, the art of process of influencing people so that they will willingly towards the achievement of group goals.

Management is the process of giving direction and controlling the various activities of the people to achieve the objectives of an organization.

295. Define the term “Grape Vine”.

The information actually transmitted through the informal channels may be inaccurate, distorted, a half-truth, a rumor, a gossip, a private interpretation and sometimes truth. It is called as grapevine.

PART – C**(16 MARK)**

296. What are the human factors in managing? Explain briefly each. [MAY/JUNE 2013]

297. Explain creativity tools used in industry with examples.

298. Describe theory X and theory Y. [AU-Apr'04]

299. What are some possible implications of theories X and Y, staffing, leading and controlling? [AU-Nov'04]

300. Enumerate the assumptions of Mc Gregor's theory X and Y. [AU-Apr'05]

301. Explain theory of Z management[Au-May'10]
302. Explain any three theories of motivation. [AU-Nov'04]
303. Discuss the different theories of motivation. [AU-Nov'05] [MAY/JUNE 2013]
304. Explain how motivation helps an organization to improve productivity? [AU-Nov'05]
305. Write short notes on Maslow's hierarchy of needs. [AU-Apr'05,june'07,May'10]
306. Explain with neat flow diagram the Porter and Lawler expectancy theory.
307. Briefly explain about the three types of basic motivating needs proposed by Mc Cleland. [AU-Apr'05]
308. Explain different styles of leadership based on authority.[AU-Nov'04,Apr'05,Dec'06,June'07,May'08] [MAY/JUNE 2013]
309. Explain the importance of strong leadership in the creation of cohesive work in an industrial organization. [AU-Nov'05]
310. Explain the qualities required for effective leadership. [AU-Apr'04]
311. Explain each type of linker's management systems.
312. What are the steps in the process of communication? [MAY/JUNE 2013]
313. What are the barriers to effective communication? Explain them. [AU-Apr'04&Apr'05]
314. Discuss the importance of communication in a modern industrial organization. [AU-Nov'05]
315. What are communication barriers and suggest measures how communication be made effective? [AU-Nov'04.,Dec'06,June'07May'10]
316. Give brief idea about electronic media in communication.[Au-May'10]
317. Discuss two-factor theory of motivation[A.U-Dec'06,June'07]
318. Discuss about the various types of organizational communication.
319. a) Discuss in detail about Herzberg's theory of motivators and satisfiers.
b) Describe the relationship of hygiene factors and job enrichment.

UNIT – V

CONTROLLING

PART – A

(1 MARK)

320. **A product layout is generally preferred for**
a. Batch production b. continuous type of production c. effective machine utilization ratio d. all of the above
321. **Break even analysis consists of**
a. Fixed expense b. variable cost c. sales revenue d. all of the above
322. **In break even analysis, the total costs consists of**
a. fixed cost + variable cost b. fixed cost + profits c. Game theory d. all of the above
323. **Problem of optimization in operation research is solved by**
a. queuing theory b. linear programming c. game theory d. all of the above.
324. **Objective of value analysis is to increase the value by**
a. increase the utility for dame cost b. decrease the cost for same utility c. both (a) and (b)above d. none of the above
325. **Linear programming can be applied to**
a. steel industry b. oil industry c. chemical industry d. all of the above
326. **ABC analysis dealt with**
a.CPM b. PERT c. inventory control d. all of the above
327. **Gantt chart provides information about**

- a. inventory control b. production schedule c. material handling d. machine utilization
- 328. MIS stands for**
 a. management intelligence service b. management inspection scheme c. management information system d. management information service
- 329. Queuing theory is associated with**
 a. sales forecasting b. inventory control c. waiting time d. production schedule
- 330. Value engineering refers to**
 a. find the depreciated value of a machine b. minimize the cost without change in quality of the product c. evaluate the utility or usefulness of the product d. determine the selling price of the product
- 331. PERT stands for**
 a. programme evaluation and review technique b. process evaluation and reporting technique c. planning evaluation and reporting technique d. planning estimation and review technique
- 332. A CPM network is**
 a. activity oriented b. event oriented c. both activity and event oriented d. neither activity nor event oriented.
- 333. Routing and scheduling are integral part of**
 a. product planning b. work study c. job analysis d. quality control
- 334. Dispatching is concerned with**
 a. better utilization of man power b. material handling layout c. getting the work started and ensuing that the plans are properly implemented d. sequence of operation to be performed from one machine to another
- 335. In inventory control, the economic order quantity refers to**
 a. lowest level of inventory b. lot most economical to process c. optimum lot size d. lot corresponding to break eve point
- 336. Given that: annual usage = 50 units, procurement cost = rs 15 per order, cost per piece =Rs 100 per item and expenditure on obsolescence, taxes, insurance, deterioration etc.=10%. The economic lot size would be approximately**
 a.9 b. 12 c. 15 d. 18
- 337. Breakeven point can be calculated by using the relation**
 a.FS/S-V b. FV/V-S c. FV/FV-S d. FS/FS-V
- 338. The procedure adopted to evaluate, maintain and improve quality standards in several stages of manufacture refer to**
 a. Product control b. process control c. quality control d. quality performance
- 339. Value engineering refers to**
 a. find the depreciated value of a machine b. minimize the cost without change in quality of the product c. evaluate the utility or usefulness of the product d. determine the selling price of the product

320	321	322	323	324	325	326	327	328	329
b	d	a	d	a	d	c	b	c	C

330	331	332	333	334	335	336	337	338	339
b	a	a	a	c	c	b	a	b	b

PART – B**(2 MARK)****340. Define control. [AU-MAY'10]**

According to Knontz “Controlling to the measurement and correction of performance in order to make sure that enterprise objectives and the plans devised to attain them are accomplished”.

341. What are the characteristics of control?

1. control process is universal
2. Control is a continuous process.
3. Control is action based.
4. Control is forward looking.

342. What is the importance of controlling?

5. Control helps to review, revise and update the policy of the organization.
6. The sound control system inspires employees to work hard and give better performance.
7. Control helps to increase the co-ordination of the subordinates in the organization.
8. Proper control ensures organizational efficiency and effectiveness.

343. Give some critical point standards of control.

1. cost standards, 2. Revenue standards, 3. Goals standards, 4. Program standards.

344. What are the *Inter-relationship* between planning and control?

The management process begins with planning and ends with control. Planning determines standards for performance. Control helps in achieving them.

345. What are the types of control?

1. feedback control, 2. concurrent control, 3. feed forward control.

346. What is feedback control?

Feedback control is the process of adjusting future action on the basis of information about past performance.

347. What is concurrent control?

This control measures for taking corrective action while any programmed meet any obstacle in this activities.

348. What is feed forward control?

It is preventive in nature. This control involves evaluation of inputs and taking corrective action before a particular operation is completed.

349. List on the differences between Feedback control and feed forward technique.

Sl. No.	Feed back	Feed forward
1	It measure only output of the process.	It measures input of the process.
2	It is submissive approach.	It is aggressive approach.
3	Less benefit.	More benefit.

350. What are the requirements for effective control? [MAY/JUNE 2013]

1. The control should be economical, 2. It must be simple, 3. It should be flexible, 4. It should be clear objectives.

351. Write some advantages of management by exception.

- a) This is used to identify important problems.

- b) It reduces unnecessary burden of the top management.
 c) It provides better utilization of managerial talent and knowledge.

352. What are traditional techniques of control?

1. Personal observation, 2. Break-Even analysis, 3. Statistical reports, 4. Budgetary control.

353. What are modern techniques of control?

1. Management audit, 2. return on Investment, 3. PERT and CPM, 4. MIS.

354. Define: Budget

According to J.Fred Meston “A budget is the expression of a firm’s plan in financial form for a period of time in to the future”.

355. What are the limitations of Budgeting? [AU-Dec,04]

1. Inaccuracy, 2. Expenditure, 3. Distortion of goals.

356. What are the classifications of Budget?[AU Apr11]

1. Functional classification, 2. Time classification, 3. Activity level.

357. What are the factors will be consider for the production budget?

1. Production stability, 2. Plant capacity, 3. Time, 4. Sales requirements.

358. Write some significances of ZBB.

- d) ZBB is also an educational process that can promote the development of the management of the management team.
 e) Managers tend to evaluate in their operations, efficiency and cost effectiveness not only during the budget cycle but the throughout the operating year.

359. What is Internal Audit?

Internal audit is done by internal auditors who are an employee of the organization. He examines the objectives, policies, plans, procedures and performance of the management.

360. What are the differences between PERT and CPM?

Sl. No.	CPM	PERT
1	It is activity oriented	PERT is event oriented
2	CPM is planning device	PERT is control device
3	It estimates only one time	It estimates three times
4	It is a deterministic model	It is probabilistic model

361. Define: MIS

“A system of obtaining abstracting, storing and analyzing data to productions information for use in planning, controlling and decision making by managers at the time they can most effectively use it”.

362. What are the characteristics of MIS?

1. MIS is must be simple, 2. MIS helps in decision making process, 3. MIS should be clear, 4. MIS should help in resolving the complicated problems effectively.

363. What are the MIS Resources?

1. Computer Hardware, 2. Software, 3. Data, 4. People.

364. What are the applications of MIS?

- f) To find out new opportunities.
 g) To provide sales forecasting.
 h) To allocate resources.
 i) To provide effective managerial activities.

365. Define: Productivity. [AU-Dec’05, Nov/Dec 2011]

Productivity is a measure of how much input is required to produce a given output i.e. the ratio (output/input) is called productivity.

366. What are the factors affecting productivity?

1. Technology, 2. Human resources, 3. Government policy, 4. Machinery and equipment, 5. Skill of the worker.

367. Define: OR [AU-Dec'05]

Operation research is systematic analysis of a problem through scientific methods, carried out by appropriate specialists, working together as a team, finding an optimum and the most appropriate solution to meet the given objective under a given set of constraints.

368. What are the applications of OR?

1. National planning and budgeting, 2. defence service operations, 3. R & D engineering, 4. Agriculture and irrigation, 5. Business management and competition, 6. Education and training.

369. Define: Linear programming.

Linear programming is a versatile mathematical technique in operation research and a plan of action solve a given problem involving linearly related variables in order to achieve the laid down objective in the form of minimizing or maximizing the objective function under given set of constraints.

370. What is Economic order quantity?

Formula, $EOQ = \frac{2DS}{C}$

D - Demand per year S- Ordering cost, C- Annual carrying cost of one unit.

371. What is JIT? [AU-May'05]

Just in time inventory system. In this method the suppliers delivers the materials to the production spot just in time to be assembled. This method reduces cost of inventory.

372. What is value engineering? [AU-Dec'04]

It is a special type of cost reduction and product improved technique.

373. What are the advantages of quality circles?

1. Increases productivity, 2. Reduction of costs, 3. Reduction of wastes, 4. Increases the self confidence and job satisfaction.

374. Write some importance of Balance Sheet.

- j) The balance sheet gives a clear picture of the financial position of the business.
- k) The balance sheet was considered to be a more important document than the profit and loss account.

375. What is fixed assets?

Those assets used in the business that is of permanently.

Example: building, machineries.

376. What are current assets?

Assets which are reasonably expected to be realized in cash

Example: bank in cash, DD.

377. What is cash flow statement?

The cash flow statement analysis the source and uses of cash particular company.

378. How to calculate ROI?

- l) investment Turnover = sales/ Capital employed or investment
- m) Percentage profit on sales = (profit / sales) x 100
- n) Return on capital employed= (profit/ capital employed)x100

379. What is preventive control? [AU-May'05]

An efficient manager applies the skills in managerial philosophy to eliminate undesirable activated which are the reasons for poor management.

380. Write some characteristics of MNC.

- 9. MNC is reduction of unit costs through producing more units.
- 10. MNC the parent company and its foreign affiliates act in close alliance and cooperation with one another.

381. What are the factors influencing MNC?

1. Political and legal factor, 2. Economic factors, 3. Socio-cultural factors.

382. What are the global theories of management?

1. Situational and contingency approach, 2. Motivation and leadership theory, 3. Organization behavior.

383. What is meant by zero – base budgeting?

The management uses the budget of the previous year as the base. By using this base, the budget for the present year is calculated by predicting the changes that might occur.

PART – C**(16 MARK)**

- 384.** Explain advantages and limitations of control management.
- 385.** Planning and control are the inseparable twins of management. Explain.
- 386.** What are the salient features of management by exception?
- 387.** Explain the steps in the process of controlling. [AU-Dec'05] [MAY/JUNE 2013]
- 388.** Explain the type of critical point standards.
- 389.** Explain the types of control.
- 390.** Explain advantages and disadvantages of budgetary control.
- 391.** PERT management technique of planning and control. Explain.
- 392.** Explain the role of MIS play at various levels of management. [AU-Dec'04]
- 393.** What is the role of IT in controlling?[A.U-Dec'06,June'07] [MAY/JUNE 2013]
- 394.** Explain the various tools and techniques to improve productivity.
- 395.** Differentiate between production and productivity.
- 396.** What tools generally found in operation research have been widely used in production and operation management? [AU-Dec'04]
- 397.** What are the advantages and disadvantages of ROI?
- 398.** What are the effective steps for direct control and preventive control? [AU-May'05]
- 399.** What are the requirements of effective control[A.U-June'07] [MAY/JUNE 2013]
- 400.** What are the factors affect the operations of the multi national enterprises? Explain. [AU-May'04]
- 401.** What advantages do multinational corporations have? What are the advantages of MNC? [AU-May'04]
- 402.** Explain a unified global theory of management? [AU-Dec'05]
- 403.** What are three types of attitudes for international manager?
- 404.** Briefly discuss about the various forms of International business with suitable example[A.U-June'07,May'08]
- 405.** Discuss about the general steps involved in the operation research procedure? [AU-May'05]
- 406.** Discuss the factors determining span of control. [AU-May'05]
- 407.** Describe the essentials of good control system[Au-May'10]
- 408.** Describe the challenges created by information technology in controlling[Au-May'10]
- 409.** Explain the various factors favoring and preventing a country in globalization process[A.U-May'10]
- 410.** Explain the impact of Liberalization quoting examples from software industry[A.U-Dec'06]
- 411.** Explain the effect of Globalization and Liberalization business environment with examples[A.U-Jun'07]
- 412.** Compare and contrast between feed forward and feed back systems in controlling[A.U-June'07]
- 413.** The role of computers in handling information[A.U-June'07]
- 414.** Bring out the different characteristics of an effective control system.

415. Explain the different types of performance control tools used for monitoring and measuring organizational performance.

SUBJECT CODE: ME 2351

SUBJECT NAME: GAS DYNAMICS AND JET PROPULSION

UNIT-I BASIC CONCEPTS AND ISENTROPIC FLOWS

PART-A

[1 MARK]

1. In a nozzle, the effect of supersaturation is to

(a.) decrease dryness fraction of steam (b.) decrease specific volume of steam (c.) increase the entropy (d.) increase the entropy

2. The density of supersaturated about that of the ordinary saturated vapour at the corresponding pressure

(a.) same as (b.) 2 times (c.) 4 times (d.) 8 times

3. The discharge at critical pressure is

(a.) zero (b.) minimum (c.) maximum (d.) none of the above

4. Thermal equilibrium means that the flow of steam is

(a.) isothermal (b.) adiabatic (c.) hyperbolic (d.) polytropic

5. When the back pressure of a nozzle is below the designed value of pressure at exit of nozzle is said to be

(a.) choked (b.) underdamping (c.) overdamping (d.) none of the above

6. When the nozzle operates with maximum mass flow the nozzle is said to be

(a.) choked (b.) underdamping (c.) overdamping (d.) none of the above

7. The action of steam in a steam turbine is

(a.) static (b.) dynamic (c.) static and dynamic (d.) neither static nor dynamic

8. The turbine blades are

(a.) straight (b.) circular (c.) curved (d.) none of the above

9. In an impulsive turbine, steam expands

(a.) wholly in blades (b.) wholly in nozzle (c.) partly in nozzle and partly in blades (d.) none of the above

10. De-level turbine is a

(a.) simple impulse turbine (b.) simple reaction turbine (c.) impulse reaction turbine (d.) none of the above

11. In turbines, the fluid undergoes a continuous steady flow process and the speed of the flow is

(a.) low (b.) very low (c.) high (d.) very high

12. De-level turbine are mostly used

(a.) where low speeds are required (b.) for small power purposes and low speeds (c.) for small power purposes and high speeds (d.) for large power purposes

13. Rateau turbine is a

(a.) simple impulse turbine (b.) simple reaction turbine (c.) impulse reaction turbine (d.) pressure compound turbine

14. Curtis turbine is a

(a.) simple impulse turbine (b.) simple reaction turbine (c.) impulse reaction turbine (d.) pressure-velocity compound turbine

15. The ratio of the workdone on the blades to the energy supplied to the blades is called

(a.) blading or diagram efficiency (b.) nozzle efficiency (c.) gross or stage efficiency (d.) mechanical efficiency

16. The ratio of the workdone on the blades per kg of steam to the total energy supplied per stage per kg of steam is called

(a.)blading or diagram efficiency (b.)nozzle efficiency (c.)gross or stage efficiency (d.)mechanical efficiency

17. Reheating of steam in a turbine

(a.) increases the workdone through the turbine(b.) increases the efficiency of the turbine (c.)reduces the wearof the turbine (d.)all of the above

18. The reheat factor depends upon

(a.) intial pressure and super heat(b.)exit pressure (c.)turbine stage efficiency (d.)all of the above

19. A closed cycle gas turbine gives the efficiency as compared to an open cycle gas turbine is

(a.)same (b.)lesser(c.)higher (d.)none of the above

20. Reheating in gas turbine

(a.)increases the thermal efficiency (b.) increases the compressor work (c.) increases the turbine work(d.) decreases the thermal efficiency

ANSWERS:

1	2	3	4	5	6	7	8	9	10
c	d	c	b	b	a	b	C	b	a
11	12	13	14	15	16	17	18	19	20
d	c	d	d	a	c	d	D	c	a

PART-B

[2 MARKS]

21. Define stagnation pressure.

[Ann Univ. May 2013]

Stagnation pressure is the pressure of the gas when it is isentropically decelerated to zero velocity at zero elevation

Where,

p_0 – Stagnation pressure, p - Static pressure, M – Mach number

22. Express the stagnation enthalpy in terms of static enthalpy and velocity of flow. [Anna Univ. Dec'2003]

Stagnation enthalpy, $h_0 = h + c^2 / 2$ Where,

h - Static enthalpy – J/Kg, c – Velocity of fluid – m/s

23. Explain Mach cone and Mach angle. [Anna Univ. May 2004 and Manonmanium Sundaranar Univ. Apr'96]

Mach Cone

Tangents drawn from the source point on the spheres define a conical surface referred to as Mach cone.

Mach Angle

The angle between the Mach line and the direction of motion of the body [flow direction] is known as Mach angle.

24. Define adiabatic process.

[Anna Univ. May 2004]

In an adiabatic process there is no heat transfer between the system and the surrounding.

i.e. $Q = 0$.

25. Define stagnation enthalpy [h_0].

Stagnation enthalpy can be defined as the enthalpy of a gas when it is isentropically decelerated to zero velocity at zero elevation,

$h_0 = h + c^2 / 2$

Where, h – Static enthalpy, c – Fluid velocity

26. Define closed and open system. [Anna Univ. May 2005]

A closed system does not permit any mass transfer, only energy transfer takes place.
In open system both the mass and energy transfer takes place.

27. What is the difference between intensive and extensive property?

[Anna Univ. May 2005]

Intensive Properties:

These properties are independent on the mass of the system.

Example: pressure, Temperature, etc.

Extensive Properties;

These properties are dependent upon the mass of the system.

Example; Total volume, Total energy, etc.

28. Distinguish between Mach wave and normal shock. [Anna Univ. Dec'2005]

Mach wave: The lines at which the pressure difference is concentrated and which generate the cone are called Mach lines or Mach waves.

Normal shock: A shock wave is nothing but a steep finite pressure wave. When the shock wave is right angle to the flow, it is called normal shock.

29. Define Crocco number. [MU, Apr'96 and Oct'99]

It is defined as the ratio between fluid velocity [c] and its maximum fluid velocity [c_{max}].

$$c_r = c / c_{max}$$

30. Name the different regions of compressible fluid flow.

[MU, Oct'99 & MS Univ.

Nov'99]

(1.) Incompressible flow region,(2.) Subsonic flow region,(3.)Transonic flow region

(4.) Supersonic flow region,(5.) Hypersonic flow region

31. Differentiate Adiabatic and Isentropic process. [MU, Oct'99]**Adiabatic process**

In an adiabatic process there is no heat transfer from the fluid to the surroundings or from the surroundings to the fluid.

$$Q = 0$$

Isentropic process

In an isentropic entropy remains constant and it is reversible. During this process there is no heat transfer from the fluid to surroundings or from the surroundings to the fluid. Therefore an isentropic process can be stated as reversible adiabatic process.

$$s = \text{constant}, Q = 0.$$

32. Differentiate nozzle and diffuser. [MU, Apr'97 & Oct'97]**Nozzle**

It is device which is used to increase the velocity and decrease the pressure of fluids.

Diffuser

It is a device which is used to increase the pressure and decrease the velocity of fluids.

33. What is Impulse function? [MU, Apr'2003] The sum of pressure force [pA] and Impulse force [$\rho A c^2$] gives Impulse function [F]

$$F = pA + \rho A c^2$$

34. Differentiate between adiabatic flow and diabatic flow. [Anna Univ. May'2004 & MU, Apr'2000]**Diabatic flow**

Flow in a constant area duct with heat transfer and without friction is known as diabatic flow [Rayleigh flow]

Adiabatic flow

Flow in a constant area duct with friction and without heat transfer is known as adiabatic flow [Fanno flow]

35. State the expression for dA / A as a function of Mach number. [MU. Oct'1995]

36. Convergent section acts as a diffuser under _____ sonic condition and acts nozzle under _____ sonic condition. [MU, Apr'96]

Ans: Super, Sub.

37. Give the expression for A / A^* in terms of Mach number. [MU, Oct'96 & Apr'97]

38. What is the critical pressure ratio of a nozzle in terms of specific heats? [MU, Oct'97]

39. What is choked flow through a nozzle? [MU, Oct'97]

The Mass flow rate of nozzle is increased by decreasing the back pressure. The maximum mass flow conditions are reached when the throat pressure ratio achieves critical value. After that there is no further increase in mass flow with decrease in back pressure. This condition is called choking. At choking condition $M = 1$.

40. What type of nozzle used for sonic flow and supersonic flow? [MSU, Nov'95]

Constant area duct nozzle is used for sonic flow and divergent nozzle is used for supersonic flow.

PART-C

[16 MARKS]

41. Air flows in a duct with a velocity of 215 m/s. The temperature of air measured at a point along the duct is 30°C , and the air pressure is 5 bar. Determine [i] stagnation pressure [ii] Mach number at that point [Anna Univ. Dec'2004]

42. Carbon dioxide expands isentropically through a nozzle from a pressure of 3.2 bar to 1 bar. If the initial temperature is 475 K, determine the final temperature, the enthalpy drop and the change in internal energy. [Anna Univ. May'2005]

43. Air [$c_p = 1.05 \text{ KJ/KgK}$, $\gamma = 1.38$] at $p_1 = 3 \times 10^5 \text{ N/m}^2$ and $T_1 = 500\text{K}$ flows with a velocity of 200 m/s in a 30 cm diameter duct available. Calculate [i] mass flow rate [ii] stagnation temperature [iii] Mach number [iv] stagnation pressure values assuming the flow is compressible and incompressible respectively. [MU, Oct'2000]

44. A plane travels with a velocity of 1,600 km/h at an altitude where the pressure and temperature are 40KPa and -35°C . Find the Mach angle and Mach number. [MU, Oct'98]

45. Air at a temperature of 33°C and a pressure of 1.1 bar is flowing with a velocity of 320 m/s. Determine the total pressure, temperature and density. [MU, Oct'99]

46. Derive an expression for the acoustic velocity of a compressible fluid flow in terms of its temperature. [Anna Univ. May 2004 & MU, Apr'97, Oct'99]

47. Prove that for Isentropic flow

Anna Univ. May'2004]

48. Show that

[Bharathiyar Univ. Nov'96 & MS Univ. Nov'96]

49. Show that

Bharatiyar Univ. Nov.97 & Madras Univ. Oct'98]

50. Show that

[Madras Univ. Oct'97 & Apr'99]

51. Air is discharged from a receiver at $p_0 = 6.91$ bar and $T_0 = 325^\circ\text{C}$ through a nozzle to an exit pressure of 0.98 bar. If the flow rate is 3600 kg/h. Determine for isentropic flow. (1.) Area, pressure and velocity at throat.(2.) Area and Mach number of exit(3.) Maximum possible velocity. [Anna Univ. Nov'2013 & MU, Apr'2000]

52. A certain quantity of air at a pressure 3.344 bar and temperature 627°C is flowing through a C-D nozzle. The exit pressure is 1.05 bar. Determine the temperature, velocity and density of air at exit. Also determine the pressure, temperature, density and velocity of air at exit if the divergent portion is to act as diffuser. Assume isentropic flow in both cases.[AU. May 2004]

53. The stagnation properties of air entering a convergent nozzle are 200 Kpa and 400 K. The throat area is 5cm^2 . Find the mass flow rate for the following back pressures [i] 105.6 Kpa [ii] 95 Kpa [iii] 130 Kpa [MU, Apr'99 & Oct'2000]

54. A conical air diffuser has an inlet area of 0.11m^2 and an exit area of 0.44m^2 . Air enters the diffuser with a static pressure of 0.18 MPa, static temperature of 370°C and velocity of 267 m/s. Calculate(1.) The mass flow rate of air through the diffuser(2.)The Mach number, static temperature and static pressure of the air leaving diffuser and (3.) The net thrust acting upon the diffuser due to diffusion. [Anna Univ. Dec'2005]

55. A convergent divergent diffuser has an exit area to throat area ratio of 2. Air enters the diffuser with stagnation properties $p_0 = 1$ Mpa and $T_0 = 400\text{K}$. The throat area is 6cm^2 . Determine the mass flow rate of flow and exit properties. [MU, Oct'98]

56. Derive the expression for the area variation in terms of Mach number and velocity variation in terms of Mach number. [Anna Univ. Dec'03]

57. On T – s diagram show the isentropic and adiabatic expansion through a nozzle and give the reasons for the observed deviation. [MU, Apr'2003]

58. Derive an expression for the mass flow rate in flow through a convergent divergent nozzle in terms of pressure ratio and inlet conditions of the gas.[MU, Oct'99]

59. Describe the behavior of flow in a convergent divergent nozzle. [MU, Apr'2000]

60. Derive

[MU, Oct'99]

UNIT-II

FLOW THROUGH DUCTS

PART-A

[1 MARK]

61. The variation of steam pressure in the nozzle depends upon

(a.) velocity of steam (b.) specific volume of steam (c.) dryness fraction of steam (d.) all of the above

62. A nozzle is said to be a convergent nozzle

(a.) when the cross section of the nozzle increases continuously from the entrance to exit (b.) when the cross section of the nozzle decreases continuously from the entrance to exit (c.) when the cross section of the nozzle first decreases from the entrance to throat and then increases from its throat to exit (d.) none of the above

63. A nozzle is said to be a divergent nozzle

(a.) when the cross section of the nozzle increases continuously from the entrance to exit (b.) when the cross section of the nozzle decreases continuously from the entrance to exit (c.) when the cross section of the nozzle first decreases from the entrance to throat and then increases from its throat to exit (d.) none of the above

64. The steam enters the nozzle at a

(a.) high pressure and a low velocity (b.) high pressure and a high velocity (c.) low pressure and a low velocity (d.) low pressure and a high velocity

65. The steam leaves the nozzle at a

(a.) high pressure and a low velocity (b.) high pressure and a high velocity (c.) low pressure and a low velocity (d.) low pressure and a high velocity

66. The ratio of the useful heat drop to the isentropic heat drop is called

(a.) condenser efficiency (b.) nozzle efficiency (c.) boiler efficiency (d.) vacuum efficiency

67. The critical pressure ratio is given by(a.) p_1/p_2 (b.) p_2/p_1 (c.) p_1^2/p_2^2 (d.) none of the above**68. The critical pressure ratio for initially wet steam is**

(a.) 0.546 (b.) 0.577 (c.) 0.582 (d.) 0.601

69. The critical pressure ratio for initially dry saturated steam is

(a.) 0.546 (b.) 0.577 (c.) 0.582 (d.) 0.601

70. The flow of steam is supersonic

(a.) at the entrance to the nozzle (b.) at the throat of the nozzle (c.) in the convergent portion of the nozzle (d.) in the divergent portion of the nozzle

71. If the critical pressure ratio for steam is 0.546, then the steam is initially

(a.) wet steam (b.) dry saturated steam (c.) super saturated steam (d.) none of the above

72. The difference of supersaturated temperature and saturation temperature at that pressure is called

(a.) degree of supersaturation (b.) degree of super heat (c.) degree of under cooling (d.) none of the above

73. Evaporation of water is a spontaneous process although it

(a) is an exothermic reaction (b) is an endothermic reaction (c) is a photo chemical reaction (d) proceed without heat loss or heat gain

74. Which of the following is wrong?(a) change in internal energy of an ideal gas on isothermal expansion is zero (b) in a cyclic process $w \neq q$ (c) for an ideal gas $[\partial h / \partial p]_t = 0$ (d) all**75. The heats of neutralization of four acids a, b, c and d when neutralized against a common base are 13.7, 9.4, 11.2 and 12.4 Kcal respectively. The weakest among these acids is**

(a) c (b) b (c) a (d) d

76. The molar heat capacity of water in equilibrium with ice at constant pressure is(a) negative (b) zero (c) infinity (d) $40.45 \text{ kJ} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}$ **77. When 10 ml of a strong acid are added to 10 ml of an alkali, the temperature rises 5°C . If 100 ml of each liquids are mixed, the temperature rise would be**

(a) 0.5°C (b) 10°C (c) 7.5°C (d) same

78. AB, A₂ and B₂ are diatomic molecules. If the bond enthalpies of A₂, AB & B₂ are in the ratio 1:1:0.5 and enthalpy of formation of AB from A₂ and B₂ – 100 kJ/mol⁻¹. What is the bond enthalpy of A₂?

(a) 400 kJ/mol (b) 200 kJ/mol (c) 100 kJ/mol (d) 300 kJ/mol

79. Identify the intensive property from the following:

(a) enthalpy (b) temperature (c) volume (d) refractive index

80. The dissociation energy of CH₄ and C₂H₆ are respectively 360 & 620 k. cal/mole. The bond energy of C–C is

(a) 260 kcal/mole (b) 180 kcal/mole (c) 130 kcal/mole (d) 80 kcal/mole

ANSWERS:

71	72	73	74	75	76	77	78	79	70
d	b	a	a	D	b	c	c	b	D
71	72	73	74	75	76	77	78	79	80
c	c	b	b	B	c	d	a	b&d	d

PART-B

[2 MARKS]

81. What is Rayleigh flow?

[MU, Apr'2003]

Flow in a constant area duct with heat transfer and without friction is known as Rayleigh flow.

82. What are the assumptions made for Rayleigh flow?

[BU, Apr'96]

(1.) One dimensional steady flow.(2.) Flow takes place in constant area section.(3.) The gas is perfect(4.) Absence of work transfer across the boundaries.

83. Give two practical examples for Rayleigh flow.

[MU, apr'2013]

(1.)Flow in Combustion Chamber.(2.)Flow in regenerators(3.)Flow in heat exchangers.(4.)Flow in intercoolers.

84. Write down the expression for the pressure ratio of two sections interms of Mach number in Rayleigh flow.

[MU, Apr'2000]

85. Define Isothermal flow with friction.

[MU, Oct'96]

Flow in a constant area duct with heat transfer and friction is known as Isothermal flow.

86. What are the assumptions made for fanno flow?

[MU, Apr'99]

(1.)One dimensional steady flow.(2.)Flow takes place in constant sectional area.
(3.)There is no heat transfer.(4.)The gas is perfect with constant specific heats.

87. Differentiate Fanno flow and Rayleigh flow.[MU, Apr'03 & Apr'2000 & Anna Univ. May'05]

Rayleigh flow

Flow in a constant area duct with heat transfer and without friction is known as Rayleigh flow.

Fanno flow

Flow in a constant area duct with friction and without heat transfer is known as Fanno flow.

88. Explain the difference between Fanno flow and Isothermal flow. [Anna Univ. Dec'2003 & Dec'04]

Fanno flow	Isothermal flow
1. Flow in a constant area duct with friction and without heat transfer is known as Fanno flow.	Flow in a constant area duct with friction and heat transfer is known as Isothermal flow.

2. Static temperature is not constant.	Static temperature remains constant.
----------------------------------------	--------------------------------------

89. Write down the ratio of velocities between any two sections in terms of their Mach numbers in a fanno flow

[Anna Univ. May'2004]

90. What are the three equation governing Fanno processes?

[MU, Apr'98]

(1.)Energy equation(2.)Continuity equatio(3.)Equation of state.

PART-C

[16 MARKS]

91. Air enters a constant area duct at $M_1 = 3$, $p_1 = 1\text{atm}$ and $T_1 = 300\text{K}$. Inside the heat added per unit mass is $Q = 3 \times 10^5 \text{ J/kg}$. Calculate the flow properties M_2 , p_2 , T_2 , ρ_2 , T_{02} and p_{02} at the exit. [Anna Univ. Dec'2003]

92. Air having Mach number 3 with total temperature 295°C and static pressure 0.5 bar flows through a constant area duct diabatically to another section where the Mach number is 1.5. Determine the amount of heat transferred and the change in stagnation pressure. [Anna Univ. May 2004]

93. Air flows through a constant area duct with inlet temperature of 20°C and inlet Mach number of 0.5. What is the possible exit stagnation temperature? It is desired to transfer heat such that at exit of the duct the stagnation temperature is 1180 K. For this condition what must be the limiting inlet Mach number? Neglect friction. [Anna Univ. Dec'2004]

94. Air enters a combustion chamber with certain Mach number. Sufficient heat is added to obtain a stagnation temperature ratio of 3 and a final Mach number of 0.8. Determine the Mach number at entry and the percentage loss in static pressure. Take $\gamma = 1.4$ and $c_p = 1.005 \text{ KJ/KgK}$. [Anna Univ. Dec'2005]

95. The stagnation temperature of air is raised from 85°C to 376°C in a heat exchanger. If the inlet Mach number is 0.4, determine the final Mach number and percentage drop in pressure. [MU, Apr'13]

96. Prove that

[MU, Oct'97]

97. Prove that Stagnation pressure ratio

[Anna Univ. May 2004]

98. Show that

[MSU, Nov'96]

99. Obtain an equation representing the Fanno line and draw the Fanno lines on h-s plane.

[MU, Apr'98]

100. Show that

UNIT-III NORMAL AND OBLIQUE SHOCKS

PART-A

[1 MARK]

121. High air fuel ratio in gas turbines

(a.)increases power output(b.)improves thermal efficiency (c.)reduces exhaust temperature (d.)do not damage turbine blades

122. A steam nozzle converts

(a.)Heat energy of steam into kinetic energy (b.) kinetic energy of steam into heat energy of steam(c.) heat energy of steam into potential energy (d.) potential energy of steam into heat energy of steam.

123. The expansion of steam in a nozzle follows

(a.)carnot cycle (b.)rankine cycle (c.)joule cycle (d.)stirling cycle

124. The flow through a nozzle is regarded as

(a.)constant volume flow (b.)constant pressure flow (c.)isothermal flow (d.)adiabatic flow

125. The weight of gass turbine per horse power developed is about that of IC engine is

(a.)same (b.)one-half (c.)one-fourth (d.)one-sixth

126. A closed cycle gas turbine works on

(a.)carnot cycle (b.)rankines cycle (c.)dual cycle (d.)joules cycle

127. A closed cycle gas turbine consists of a

(a.)compressor (b.)heating chamber (c.) cooling chamber(d.)all the above

128. In a closed cycle gas turbine the air is compressed

(a.)isothermally (b.) adiabatically(c.)polytropically (d.)isentropically

129. The gas in cooling chamber of a closed of a closed cycle gas turbine is cooled at

(a.)constant volume (b.) constant temperarure (c.)constant pressure (d.)none of the above

130. The maximum combustion pressure in gas turbine compare as to CI engine is

(a.)more (b.) less(c.)same (d.)zero

131. Intercooling in gas turbines

(a.) decreases net output but increases thermal efficiency (b.) increases net output but increases thermal efficiency (c.) decreases net output and thermal efficiency both (d.) increases net output and thermal efficiency both

132. The maximum temperature in gas turbine is

(a.)200°C (b.) 500°C (c.) 700°C (d.) 1000°C

133. A system is taken from state A to state B along two different paths 1 and 2. The heat absorbed and works done by the system along these paths are Q_1 and Q_2 and W_1 and W_2 respectively. Then

(a) $Q_1 = Q_2$ (b) $W_1 + Q_1 = Q_2 + W_2$ (c) $W_1 = W_2$ (d) $Q_1 - W_1 = Q_2 - W_2$

134. In which of the following process does the entropy decrease?

(a) dissolving of NaCl in water (b) evaporation of water (c) conversion of $CO_2(g)$ into dry ice (d) none

135. Calculate the enthalpy change when 50 ml of 0.01 M Ca(OH)₂ reacts with 25 ml of 0.01 M HCl. Given that ΔH^0_{neut} of a strong acid and strong base is 140 cal/ equivalent

(a) 14.0 cal (b) 35 cal (c) 10.0 cal (d) 7.5 cal

136. In a reversible adiabatic change ΔS is

(a) infinity (b) zero (c) equal to $C_v dT$ (D) equal to $nR \ln V_2/V_1$

137. Calculate the work done when 1 mol of an ideal gas is compressed reversibly from 1.00 bar to 5.0 bar at a constant temperature of 300 K

(a) -14.01 kJ (b) 16.02 kJ (c) 4.01 kJ (d) -8.02 kJ

138. The factor that does not influence the heat of reaction is

(a) the physical state of reactants and products (b) the temperature (c) the pressure or volume (d) the method by which the final products are obtained

139. For an irreversible isothermal expansion of an ideal gas

(a) $\Delta S_{\text{sys}} = \Delta S_{\text{surr}}$ (b) $\Delta S_{\text{sys}} > \Delta S_{\text{surr}}$ (c) $|\Delta S_{\text{sys}}| > |\Delta S_{\text{surr}}|$ (d) $|\Delta S_{\text{sys}}| < |\Delta S_{\text{surr}}|$

140. An endothermic reaction is spontaneous only if

(a) the entropy of the surrounding increases (b) entropy of the system increases (c) total entropy decreases (d) none

ANSWERS:

121	122	123	124	125	126	127	128	129	130
c	a	b	d	d	d	d	d	c	b
131	132	133	134	135	136	137	138	139	140
a	c	d	c	b	b	c	d	c	b

PART-B

[2 MARKS]

141. What is normal shock?

[MU, Apr'2003]

When the shock wave is at right angle to the flow, it is called normal shock.

142. What is oblique shock?

[Anna Univ. May 2004 & MU, Apr'2003]

When the shock wave is inclined at an angle to the flow, it is called oblique shock.

143. What is Prandtl – Meyer relation?

[MU, Apr'96]

Prandtl-Meyer relation which is the basic of other equation for shock waves. It gives the relationship between the gas velocities before and after the normal shock and the critical velocity of sound. $M_x^* \times M_y^* = 1, C_x \times c_y = a^{*2}$

144. Define strength of shock wave. [Anna Univ. Dec'2003, May 2004 & MU, Apr'13]

It is defined as the ratio of difference in downstream and upstream shock pressures $[p_y - p_x]$ to upstream shock pressure $[p_x]$. It is denoted by ξ . where, $\xi = (p_y - p_x) / p_x$

145. What are applications of moving shock wave?

[MS Univ. Apr'96]

It is used in

(1.) Jet engines (2.) Shock tubes (3.) Supersonic wind tunnel (4.) Practical admission turbines.

146. Shock waves cannot develop in subsonic flow? Why?

[MS Univ. Nov'95]

In subsonic flow, the velocity of fluid is less than the velocity of sound. Due to this reason, deceleration is not possible in subsonic flow. So shock waves cannot develop in subsonic flow.

147. Write down the Rankine-Hugoniot equation.

[MU, Oct'97]

148. Give the difference between Normal and Oblique shocks. [MS Univ. Nov'97 Oct'96 & MU, 2000]

Normal shock	Oblique shock
--------------	---------------

1. Shock wave is right angle to the flow.	Shock wave is inclined at an angle to the flow.
2. One dimensional flow.	Two dimensional flows.

149. The stagnation pressure _____ and static pressure _____ across a normal shock. [MU, Oct'95]

Ans.: Decreases, Increases.

150. What are properties changes across a normal shock? [MU, Apr'96]

(1.) Stagnation pressure decreases. (2.) Stagnation temperature remains constant. (3.) Static temperature and static pressure increases.

PART-C

[16 MARKS]

151. The state of a gas [$\gamma = 1.3$, $R = 0.469 \text{ KJ/Kg K}$] upstream of a normal shock wave is given by the following data: $M_x = 2.5$, $P_x = 2 \text{ bar}$, $T_x = 275 \text{ K}$. Calculate the Mach number, pressure, temperature of the gas downstream of the shock. [Anna Univ. May 2005]

152. Air flows adiabatically in a pipe. A normal shock wave is formed. The pressure and temperature of air before the shock are 150 kN/m^2 and 25°C respectively. The pressure just after the normal shock is 350 kN/m^2 . Calculate [i] Mach number before the shock [ii] Mach number, static temperature and velocity of air after the shock wave. [iii] Increase in density of air [iv] Loss of stagnation pressure of air [v] Change of entropy [Anna Univ. Apr 2013]

153. A convergent divergent nozzle is designed to expand air from a reservoir in which the pressure is 800 KPa and temperature is 40°C to give a Mach number at exit of 2.5. The throat area is 25 cm^2 . Find [i] Mass flow rate [ii] Exit area [iii] When a normal shock appears at a section where the area is 40 cm^2 determine the pressure and temperature at exit. [Anna Univ. Dec'2003 & MU, Apr'2003]

154. When a converging divergent nozzle is operated at off-design condition a normal shock occurs at a section where the cross sectional area is 18.75 cm^2 in the diverging portion. At inlet to the nozzle the stagnation state is given as 0.21 MPa and 36°C . The throat area is 12.5 cm^2 and exit area is 25 cm^2 . Estimate the exit Mach number, exit pressure and loss in stagnation pressure for flow through nozzle. [Anna Univ. Dec'05]

155. A pilot tube kept in a supersonic wind tunnel forms a bow shock, ahead of it. The static pressure upstream of the shock is 16 KPa and the pressure at the mouth is 70 KPa . Estimate the Mach number of the tunnel. If the stagnation temperature is 300°C , calculate the static temperature and total pressure upstream and downstream of tube.

156. Starting from the energy equation for flow through a normal shock obtain the following relation. [Prandtl-Meyer relation] [i] $c_x \times c_y = a^*2$ [ii] $M_x^* \times M_y^* = 1$ [Anna Univ. May 2004, Bharathidasan Univ. Nov'96, Bharathiyar Univ. Nov'96, MSU Apr'97, Madras Univ. Apr'98 Apr'02 & Apr'03]

157. Prove

[Bharathiyar Univ. Nov'97]

158. Derive the static pressure ration across the shock.

[Anna Univ. Dec'03, MU – Oct'97 & Oct'96]

159. Derive the temperature ratio across the shock.

[MU – Apr'96 & Apr'03]

160. Derive Rankine – Hugoniot equation. [MKU – Apr'96, MSU – Nov'95 & Nov'96, MU Oct'95 & Oct'99]

UNIT-IV

JET PROPULSION

PART-A

[1 MARK]

161. The principle of jet propulsion is obtained from the application of Newton's which law?
a) Newton's first law b) Newton's second law
c) Newton's third law d) Newton's law of inertia
162. Which of the following is a type of air breathing engine.
a) ramjet engine b) turbofan engine
c) pulse jet engine d) all of the above
163. The ratio of thrust power to power input of engine is defined as
a) thermal efficiency b) overall efficiency
c) engine efficiency d) none of the above
164. Which type of compressor is used in turbojet
a) reciprocating compressor b) rotary compressor
c) axial piston compressor d) screw compressor
165. For which of the following engine gear arrangement is not necessary
a) turbo fan engine b) turbo prop engine
c) both a and b d) none of the above
166. The product of thrust and flight speed gives which of the following
a) nozzle thrust b) engine power
c) thrust power d) jet power
167. Specific thrust is given by which of the following formula
a) m/F b) Fxm
c) F/m d) $1/FXM$
168. The ratio of fuel consumption rate per unit thrust is said to be
a) specific thrust b) thrust
c) thrust specific fuel consumption d) relative thrust
169. Thrust developed per unit weight flow rate is said to be
a) specific thrust b) specific impulse
c) relative thrust d) relative impulse
170. 'Cj' in the equation $F = m_j - m_a u$ stands for which of the following
a) mass of fuel b) velocity of aircraft
c) velocity of jet d) velocity of fuel ejecting from nozzle
171. In ramjet engine the conversion of kinetic energy of the entering air into pressure energy is called
a) ram conversion b) energy conversion
c) ram effect d) pulse effect

172. Propulsive efficiency is given by the formula
 a) propulsive power x power input b) power input/propulsive power
 c) 1/power input x 100 d) none of the above
173. Turbojet engine works on which of the following cycle
 a) otto cycle b) diesel cycle
 c) brayton cycle d) dual cycle
174. By-pass ratio is given by the ratio of
 a) mass flow rate of cold air to mass flow rate of hot air
 b) mass flow rate of hot air to mass flow rate of cold air
 c) mass flow rate of hot and cold air mixture to that of cold air
 d) none of the above
175. Ramjet engine works on which of the following cycle
 a) brayton cycle b) otto cycle
 c) diesel cycle d) dual cycle
176. Speed of the air entering the combustion chamber should not be higher than which of the following value of mach number
 a) 0.1 b) 0.2 c) 1 d) 10
177. The ratio of flight speed to jet velocity is said to be
 a) effective speed b) effective speed ration
 c) relative speed d) flight speed
178. Which of the following is not an type of air breathing engine
 a) ramjet engine b) turbo prop engine
 c) turbo fan d) rocket engine
179. Velocity of air flow at propeller is given by the formula
 a) $C = \frac{1}{2}(u+C_j)$ b) $C = \frac{1}{2}(u \times C_j)$
 c) $C = \frac{1}{2}(u - C_j)$ d) $C = (u + C_j)$
180. Which of the following engine is best suited for piloted-air-crafts
 a) ramjet engine b) turbojet engine
 c) pulse jet engine d) turbo prop engine

161	162	163	164	165	166	167	168	169	170
C	D	B	B	A	C	C	C	B	C
171	172	173	174	175	176	177	178	179	180
C	B	C	A	A	B	B	D	A	B

PART-B**[2 MARKS]****181. Define propulsive efficiency.****[Anna Univ. May 2004, MU, April 2000]**

It is defined as the ratio of propulsive power [or] thrust power to the power output of the engine. $\eta_p = \text{Propulsive power} / \text{Power output}$

182. What is thrust [or] drag?**[MU, Apr'96]**

The force which propels the aircraft towards at an given speed is called as thrust or propulsive force. This thrust mainly depends on the velocity of gases at the exit of the nozzle.

183. What are the main parts of Ramjet engine?**[Anna Univ. May 2004]**

The main parts of Ramjet engine are;[i] Supersonic diffuser[ii] Subsonic diffuser[iii] Combustion chamber[iv] Discharge nozzle

184. What are the various types of air breathing engine?[MU, April 2013 MSU, April 97]

The various propulsive engines are;[i] Ramjet engine[ii] Pulse jet engine[iii] Turbojet engine [iv] Turboprop engine[v] Turbofan engine

185. Find the ratio of jet speed to flight speed for optimum propulsive efficiency.**[Anna Univ. Dec'2004]**

Propulsive efficiency, $\eta_p =$

186. What is turboprop unit?

[MU, Oct'97]

Turboprop engine is very similar to turbojet engine. In this type, a turbine which is used to drive the compressor and propeller.

187. Define Effective Speed ratio.

The ratio of flight speed to jet velocity is known as effective speed ratio.

$$\sigma = u/C_j$$

188. What is thrust augmentation?

To achieve better take-off performance, additional fuel is burnt in the tail pipe between the turbine exhaust section and entrance section of the exhaust nozzle. This method of thrust augmentation increases the jet velocity and is known as after burning. It is used for fast and easier take off.

189. Why ramjet engine does not require a compressor and a turbine?

In ramjet engine due to supersonic and subsonic diffuser, the static pressure of air is increased to ignition pressure. So, there is no need of compressor and turbine.

PART B [16 MARK QUESTIONS]

190. A turbojet propels an aircraft at a speed of 900 km/h while taking 3000 kg of air per minute. The isentropic enthalpy drop in the nozzle is 200 kJ/kg and the nozzle efficiency is 90%. The air-fuel ratio is 85 and the combustion efficiency is 95%. The calorific value of the fuel is 42,000 kJ/kg. Calculate: [i] Propulsive power [or] Thrust power [ii] Thermal efficiency [iii] Propulsive efficiency
[Anna Univ. Dec'2003, 2004]

191. The flight speed of a turbojet is 800 km/h at 10,000 m altitude. The density of air at that altitude is 0.17 kg/m³. The drag for the plane is 6.8 kN. The propulsive efficiency of the jet is 60%. Calculate the SFC, Air-fuel ratio, Jet velocity, Assume the calorific value of fuel is 45000 kJ/kg and overall efficiency of the turbojet plane is 18%. [AU. Dec'2005 & MU, Apr'2013]

192. A ramjet engine operates at $M = 1.2$ at an altitude of 6500m. The diameter of inlet diffuser at entry is 50cm and the stagnation temperature at the nozzle entry is 1500K. The calorific value of the fuel used is 40 MJ/kg. The properties of the combustion gases are same those of air [$\gamma = 1.4$, $R = 287\text{J/kgK}$]. The velocity of the air at the diffuser exit is negligible, calculate: [i] The efficiency of the ideal cycle [ii] Flight speed. [iii] Air flow rate. [iv] Diffuser pressure ratio [v] Fuel air ratio [vi] Nozzle jet Mach number.
[Anna Univ. Dec'2004]

193. Explain with neat sketches the principle of operation of [i] Turbofan engine, [ii] Turbojet engine.
[Anna Univ. May 2004]

194. Compare the constructional features and operating performance of turboprop and turbojet engines
[Anna Univ. Dec'2003]

[Anna Univ. May 2005]

195. Explain the construction and operation of solid propellant rocket engine.

Also name any four solid propellants.

[Anna Univ. Dec' 2003]

196. With the help of neat sketches explain any two arrangements used for fuel feeding in liquid propellant rocket systems.
[Anna Univ. Dec' 2003]

UNIT-V

SPACE PROPULSION

PART A [1 MARK QUESTIONS]

197. The main difference between rocket propulsion and jet propulsion is
- the former need more fuel to start
 - for combustion, oxygen is taken from the atmosphere for the latter propulsion
 - for the former propulsion, oxygen is taken from the atmosphere for combustion
 - none of the above
198. If the fuel and oxidizer are different from each other in its chemical nature, then the propellant is called
- monopropellant
 - homopropellant
 - heterogeneous propellant
 - bipropellant
199. Mostly used fuel with liquid oxygen oxidizer is
- alcohol
 - methane
 - aniline
 - ethane
200. The best oxidizer used with aniline fuel is
- liquid oxygen
 - white fuming nitric acid
 - hydrogen peroxide
 - red fuming nitric acid
201. Which of the following is the basic processor in combustion
- injection
 - atomization
 - mixing
 - all of the above
202. Which of the following engine is difficult to stop in the mid-way
- ramjet engine
 - turbojet engine
 - solid propellant engine
 - liquid propellant engine
203. Thrust developed per unit weight flow rate of the propellant is known as
- thrust
 - specific thrust
 - specific impulse
 - relative impulse
204. Specific propellant consumption is given by the formula
- W_p/F
 - F/W_p
 - $F \times W_p$
 - none of the above
205. Expansion of IWR is
- intense weight ratio
 - inertia weight ratio
 - impulse to weight ratio
 - none of the above
206. Expansion of JATO is
- jet assisted take off
 - jet applied take off
 - jet accelerated take off
 - none of the above
207. The ratio of propellant flow to throat force is given by
- specific impulse
 - characteristic velocity
 - flow coefficient
 - weight flow coefficient
208. Which of the following is classification of rocket engine based on source of energy
- nuclear rocket engine
 - electrical rocket engine
 - chemical rocket engine
 - all the above
209. The ratio of power output of engine to input power through fuel
- thrust coefficient
 - propulsive efficiency
 - thermal efficiency
 - thrust
210. A liquid propellant which contains both fuel and oxidizer in a single chemical is called as
- heteropropellant
 - monopropellant
 - bipropellant
 - homopropellant
211. Propulsive efficiency is also known as

- a) thermal efficiency
b) relative efficiency
c) overall efficiency
d) none of the above
212. Characteristic velocity is given by the formula
a) C_j/C_f b) $C_j \times C_f$ c) C_f/C_j d) $1/C_f \times C_j$
213. It is difficult to build large solar powered rockets because
a) large surface area is required to capture solar energy
b) cost is high
c) thrust produced is less
d) none of the above
214. In which propellants plastics, polymers and PVC are used as fuels
a) heterogeneous propellant b) monopropellant
c) bipropellant d) both b and c
215. Which of the following is used as homogenous propellant
a) nitroglyceline b) mitrocellulose
c) both a and b d) none of the above
216. In which of the following engine decrease of speed is not possible
a) ramjet engine b) liquid propellant engine
c) solid propellant engine d) none of the above

197	198	199	200	201	202	203	204	205	206
C	D	B	D	D	C	C	A	C	A
207	208	209	210	211	212	213	214	215	216
C	D	C	B	D	A	A	A	C	c

PART-B**[2 MARKS]**

217. Differentiate Jet propulsion and Rocket propulsion. [or] Differentiate Air breathing engine and Rocket engine. [Anna Univ. Apr'2013]

Jet Propulsion	Rocket Propulsion
1. Oxygen required for combustion purpose is taken from the atmosphere.	Oxygen is filled in a tank in the rocket engine itself and used for combustion purpose.
2. Altitude limitation.	No altitude limitation.
3. Flight speed always less than jet velocity.	Flight speed can be greater than jet velocity.
4. Reasonable efficiency.	Low efficiency except at extremely high flight speed.
5. Thrust decreases with altitude.	Thrust improves slightly with altitude.

218. What is monopropellant? Give one example for it. [Anna Univ. May 2004]

A liquid propellant which contains both the fuel and oxidizer in a single chemical is known as a monopropellant. It is stable at normal ambient conditions and liberates thermo-chemical energy on heating.

219. Classify the rocket engines based on source of energy employed[AU. May 2004]

On the basis of source of energy employed, rocket engine can be classified as;[i] Chemical rocket engines[ii] Solar rocket engines[iii] Nuclear rocket engines[iv] Electrical rocket engines.

220. What is specific impulse of a rocket? [MU, Apr'2003]

The thrust developed per unit weight flow rate of the propellant is known as specific impulse. $I_{sp} = F / W_p$

221. What is bipropellant? [AU. Dec 2010]

If the fuel and oxidizer are different from each other in its chemical nature, then the propellant is called bipropellant.

Example: Liquid oxygen – gasoline; hydrogen peroxide – hydrazine

222. Define thrust.

The force which propels the rocket forward at a given speed is known as thrust.

223. Define specific propellant consumption.

The propellant consumption rate per unit thrust is known as specific propellant consumption.

$$SPC = W_p/F$$

224. Define propulsive efficiency.

It is defined as the ratio of propulsive power to the power output of the engine.

$$\eta_p = \text{Propulsive power/Power output of the engine}$$

225. Define thermal efficiency.

It is defined as the ratio of power output of the engine to the input power through fuel.

$$\eta_t = \text{Power output of the engine/Power input to the engine.}$$

PART B [16 MARK QUESTIONS]

226. The rocket nozzle has a throat area of 18 cm^2 and combustor pressure of 25 bar. If the specific impulse is 127.42 sec. and the rate of flow of propellant is 44.145 N/s, determine the thrust coefficient, propellant weight flow coefficient, specific propellant consumption and characteristic velocity. [Anna univ. May 2004]

227. Calculate the thrust, specific impulse, propulsive efficiency, thermal and overall efficiencies of a rocket engine from the following data; Effective jet velocity = 1250 m/s, Flight to jet speed ratio = 0.8, Oxidizer flow rate = 3.5 kg/s, Fuel flow rate = 1 kg/s, Heat of reaction of exhaust gases = 2500 kJ/kg [Anna Univ. Dec'2005]

228. The specific impulse of a rocket is 125 s and the flow rate of propellant is 44 kg/s. The nozzle throat area is 18 cm^2 and the pressure in the combustor is 25 bar. Determine the thrust coefficient, propellant flow coefficient, specific propellant consumption and characteristic velocity.

229. Explain the construction and operation of solid propellant rocket engine. Also name any four solid propellants. [Anna Univ. Dec'2003]

230. With the help of neat sketches explain any two arrangements used for fuel feeding in liquid propellant rocket systems. [Anna Univ. Dec'2003]

231. List the main components of liquid propellant rocket engine. [Anna Univ. May'2004]

232. Compare solid and liquid propelled rocket systems. Also explain how a solid propellant rocket engine works. [Anna Univ. Apr'2003]

233. What are the desirable characteristics of liquid propellants? Name few liquid propellants used in rocket propulsion? [Anna Univ. Apr'2013]

SUBJECT CODE: ME2352

SUBJECT NAME: DESIGN OF TRANSMISSION SYSTEMS

UNIT -I DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS

PART A

1 MARK

1. The design stress for a component subjected to a completely reversible load, is found by applying the factor of safety to
 - A) Ultimate strength
 - b) endurance strength
 - c) Yield strength
 - d) fatigue strength
2. Short time fatigue life testing is done by using
 - a) Soderberg's equation
 - b) Basquin's equation
 - c) Miner's equation
 - d) Gerber's equation
3. Endurance strength is found at
 - a) 10^3 cycles of reversals
 - b) 10^9 cycles of reversals
 - c) 10^6 cycles of reversals
 - d) 10^7 cycles of reversals
4. For a material with $S_u \geq 1400$ MPa the endurance limit is
 - a) $0.9 S_u$
 - b) $0.5 S_u$
 - c) $0.65 S_u$
 - d) $0.8 S_u$
5. It is possible to get the complete picture of variable stresses by referring to
 - a) S – N diagram
 - b) Goodman's diagram
 - c) Soderberg's diagram
 - d) Gerber's diagram
6. Improvement of fatigue strength using pre- stressing is done for
 - a) Ductile materials
 - a) Parts subjected to unidirectional variable stress
 - b) Parts subjected to completely reversible stress
 - c) Parts subjected to variable load
7. Loading a component such that the variable stress is less than endurance limit for sometime is termed as
 - a) prestressing
 - b) training
 - c) underloading
 - d) low cycle fatigue
8. Endurance correction factor for shear load is
 - a) 0.5
 - b) 0.6
 - c) 0.7
 - d) 0.85
9. Shaft A has a diameter double the diameter of shaft B of the same material and transmits 80kW. Assuming both shafts rotate at the same speed the power transmitted by B is
 - a) the same as that of A
 - b) 40kW
 - c) 10kW
 - d) 20kW
10. Design of power transmission shafting is based on
 - a) Maximum shear stress theory of failure
 - b) St. Venant theory
 - c) Rankine's theory
 - d) Heigh's theory
11. A cantilever is likely to fail due to excessive stress in
 - a) single shear
 - b) torsional shear
 - c) tension
 - d) compression
12. Increase in factor of safety causes decrease in
 - a) cost
 - b) size
 - c) induced stress
 - d) strength of machine member
13. A bar of length L meters hanging weighing W N/m carries a load of P Newton at the free end. The tensile force at a distance d meters from of the bar in Newton is
 - a) P
 - b) $\{P + W (L - d)\}$
 - c) $\{P + W (L + d)\}$
 - d) $(P + Wd)$
14. The area under stress-strain curve represents

Long lay: In these ropes, the direction of twist of the wires in the stand is the same as that of the stands in the rope.

27. List out the various stresses induced in the wire ropes [AU MAY-13]

- Direct stress due to the weight of the load to be lifted and weight of the rope
- Bending stress when the rope passes over the sheave
- Stress due to acceleration
- Stress during starting stopping.

28. Give any three applications of chain drives

- In transportation industry
- Agricultural machinery
- metal and wood working machines

29. Why tight side of the belt should be at the bottom side of the pulleys?[AU MAY-10]

Because the driving pulley pulls the belt from bottom side and delivers it to the upper side. So it is obvious that the bottom side of the belt is tight.

30. Distinguish between bush chain and roller chain.[AU MAY-10]

The bushed chains are similar in design except that they have no rollers.

The roller chains consist of two rows of outer and inner plates. The chain rollers mounted on the bushings roll over the sprocket teeth.

PART C

16 MARKS

31. Design a V-belt drive to the following specifications:

Power to be transmitted = 7.5KW, Speed of driving wheel = 1440rpm, Speed of drive wheel = 400rpm, Diameter of driving wheel = 300mm, Centre distance = 1000mm, Service = 16hrs/day (AU MAY 06)

32. Design a wire rope for a elevator in a building 60m high and for a total load of 20kN. The speed of the elevator is 4m/sec and the full speed is reached in 10secs. (AU May 12)

33. A truck equipped with a 9.5kW engine used a roller chain as the final drive to the rear axle. The driving sprocket runs at 900rpm and the driven sprocket at 400 rpm with a centre distance of approximately 600mm. Select the roller chain (Au may 07)

34. A 12.7mm pitch silent chain operating under steady load conditions, transmits 30kW from an electric motor to a centrifuge. Design the silent chain. (AU May 12)

35. A centrifugal pump running at 340rpm is to be driven by a 100kW motor running at 1440rpm. The drive is to work for at least 20hrs every day. The centre distance between the motor shaft and the pump shaft is 1200mm. Suggest a suitable multiple V-belt drive for this application. Also calculate the actual belt tensions and stress induced. [AU MAY-10]

UNIT – II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS

PART A

1 MARK

36. Bolts of a split muff coupling are designed for

- shearing
- tension
- combined tension and shear
- none of the above

37. For a square key width = 0.25 times the diameter of shaft, the weakening effect reduces the strength of the shaft to

- a) 80% b) 67.5% c) 70% d) 50%

38. Muff is designed as a

- a) thin cylinder b) thick cylinder
c) hollow shaft d) none of the above

39. It is desirable to increase the diameter of the pin in a bushed pin type of flexible coupling for

- a) higher stresses due to shear
b) keeping the magnitude of b.m. small by reducing the unsupported length of pin.
c) fitting the pin in the bush d) reducing thickness of flange

40. Rubber bush is used in flexible coupling to

- a) avoid wear of the pin b) allow proper fixation of the pin
c) allow small misalignment of the shaft d) avoid failure of C.I. flanges

41. In a squared and ground helical spring the effective number of turns is increased by

- a) one b) two c) 1.5 d) null

42. Frequency of the fluctuating load on a helical compression spring should be

- a) less than natural frequency of vibration
b) 20 times the natural frequency of vibration
c) slightly greater than the natural frequency
d) Twenty times less than the natural frequency of vibration

43. Two concentric springs with stiffness equal to 100 N/mm and 80 N/mm respectively when subjected to a load of 900 N will deflect by

- a) 9 mm b) 11.25 mm c) 5 mm d) 31.5 mm

44. Stiffness of a the spring can be increased by

- a) increasing the number of turns b) increasing the free length
c) decreasing the number of turns d) decreasing the spring wire diameter

45. The stress induced in an extra full length leaf in case of a prestressed leaf spring is

- a) 1.5 times that in graduated leaves b) equal to that in graduated leaves
c) dependent on the ratio of the number of extra full length and graduated leaves
d) none of the above

46. In a four stroke I.C. engine completing 3000 r.p.m. the natural frequency of vibration of the exhaust valve spring should be

- a) 1200 Hertz b) 1000 Hertz c) 600 Hertz d) 120 Hertz

47. Initial gap between two turns of a close coiled helical tension spring should be

- a) 0.5 mm b) based on the maximum deflection c) 1 mm d) zero

48. A spring with 25 active coils cannot be accommodated with in a given space. Hence 5 coils of the spring are cut. The stiffness of the new spring will be

- a) the same b) 1.25 times the original spring
c) 0.8 times the original spring d) none of the above

49. The type of stress induced in a close soiled helical tension spring is

- a) tensile b) torsional shear c) compressive d) none of the above

50. Wahl suggested the correction in the stress factor to account for

- a) the additional transverse shear stress b) stress concentration
c) fatigue stress d) none of the above

51. Springs with rectangular or square cross section are used for

a) higher stiffness b) larger volume c) large length d) none of the above

52. The ratio of the stress induced in extra full length leaves to that in graduated leaves in a leaf spring is

a) 2 b) 1.5 c) 1.2 d) none of the above

53. Due to additional of extra full length leaves the deflection of a semi- elliptic springs

a) increases b) decreases c) does not change d) is doubled

54. The same stress and deflection formulae can be used for both, the semi- elliptic as well as the cantilever springs if

a) Force and maximum span for both is the same

b) Force on a same semi- elliptic spring is twice to that on a cantilever spring and the length is half

c) The force on a semi- elliptic spring is half of that on a cantilever spring and the length is double

d) The force and length of a semi- elliptic spring are double to those of a cantilever spring.

55. A spring of stiffness 100 N/mm used in a spring loaded safety valve of diameter 20 mm on a boiler with the pressure inside the boiler equal to 1 Mpa should be initially compressed by

a) 5 mm b) 3.14 mm c) 2 mm d) 6.28 mm

ANSWERS

36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
b	b	c	b	c	b	d	c	c	b	b	d	b	b	b	b	b	b	d	b

PART B

2 MARKS

56. State the law of gearing (Au may 06)

The law of gearing states that for obtaining a constant velocity ratio, at any instant of teeth the common normal at each of contact should always pass through a pitch point, situated on the line joining the centers of rotation of the pair of mating gears.

57. Why is pinion made harder than gear?

Because the teeth of pinion undergo more number of cycles than those of gear and hence quicker wear.

58. What are the main types of gear tooth failure?

a. Tooth breakage

b. Tooth wear: i. Abrasion ii. Pitting iii. Seizure

59. Why is a gear tooth subjected to dynamic loading?

In a gear tooth, dynamic loads are due to the following reasons:

a. Inaccuracies of tooth spacing

b. Elasticity of parts

c. Deflection of teeth under load

d. Dynamic unbalance of rotation masses.

60. What is virtual number of teeth in helical gears?may -07

The number of teeth on the virtual spur gear in the normal plane is known as virtual number of teeth.

61. What are the spiral gears? Why hands of helix are used?

A pair of crossed helical gears is known as spiral gears.

In most applications, the spiral gears have the same hand.

62. Differentiate double helical and herringbone gears.

When there is groove in between the gears, then the gears are specifically known as double helical gears.

When there is no groove in between the gears, then the gears is known as herringbone gears.

63. What are the advantages of helical gears over spur gears?

Less noisy, stronger than spur gears, can run at greater speeds than spur gears.

64. Why dedendum value is more than addendum value?

To provide necessary clearance between the gears while meshing. In other words, this is to provide necessary clearance between the gears while meshing.

65. Define module. [AU MAY-10]

It is the ratio of the pitch circle diameter to the number of teeth.

PART C

16 MARKS

66. a pinion of 120 mm pitch diameter, running at 900rpm transmits 5kW of power to gear whose pitch diameter is 360mm. For straight tooth, the angle of pressure is 20. Determine the tangential force, the transverse or bending force on shafts and torques on driving and driven shafts. [AU MAY-12]

67. Design a spur gear drive required to transmit 45kW at a pinion speed of 800rpm. The velocity ratio is 3.5:1. The teeth are 20 full depth involute with 18 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe static stress of 18-N/mm². Assume medium shock conditions. [AU MAY-10]

68. a compressor running at 300 rpm is driven by a 15kW, 1200rpm motor through a 14 1/2 full depth spur gears. The centre distance is 375mm. The motor pinion is to be of C30 forged steel hardened and tempered, and the driven gear is to be of a cast iron. Assuming medium shock condition, design the gear drive completely.

69. In a spur gear drive for a stone crusher, the gears are made of C40 steel. The pinion is transmitting 30kW at 1200rpm. The gear ratio is 3. Gear is to work 8hrs/day. Six days a week and for 3 years. Design the drive. [AU MAY-12]

70. Design a helical gear to transmit 15kW at 1400rpm to the following specification speed reduction is 3. Pressure angle is 20°. Helix angle is 15°, the material of both the gears is C45 steel. Allowance static stress 180N/mm², surface endurance limit 800N/mm² young's modulus of material = 2x10⁵N/mm².

UNIT – III BEVEL, WORM AND CROSS HELICAL GEARS

PART A

1 MARK

71. The coefficient of friction in rolling contact bearing is

- a) 0.1 b) 0.0001 c) 0.0018 d) 0.005

72. The diameter of shaft for which 6207 bearing is used is

- a) 70 mm b) 7 mm c) 0.7 mm d) 35 mm

73. If the dynamic capacity of 6205 bearing is 10.8 kN the same for 6305 bearing must be

- a) 8 kN b) 10 kN c) 16.2 kN d) 5 kN

74. Life of the ball bearing is halved if the load P is changed to

- a) $2P$ b) $0.5P$ c) $1.1P$ d) $1.26P$

75. Combination of radial and thrust load is taken by

- a) deep groove type ball bearing b) needle bearing
c) cylindrical roller bearing d) spherical roller bearing

76. The ratio of average life and rating life of the ball bearing is

- a) 3 b) 5 c) 4 d) 2.5

77. Type of the failure which occurs in ball bearing is

- a) shear b) fatigue c) bending d) crushing

78. Race rotation factor for outer race rotation is

- a) 1.00 b) 2.00 c) 1.5 d) 1.2

79. Life of the roller bearing is given in million number of cycles by

- a) $\left(\frac{C}{P}\right)^3$ b) $\left(\frac{C}{P}\right)^{10/3}$ c) $\left(\frac{C}{P}\right)^{2.5}$ d) $\left(\frac{C}{P}\right)^4$

80. Striebeck equation defines

- a) life of R.B.C. b) static capacity of R.B.C.
c) dynamic load capacity of R.B.C d) none of the above

81. Preloaded rolling contact bearing are used for

- a) heavy radial load b) precision machine bearing
c) small axial space d) limited radial space

82. Cage is not required in

- a) taper roller bearing b) needle roller bearing
c) spherical roller bearing d) thrust bearings

83. Load rating of 620 bearing is 22.5 kN. The life of the bearing should be 27×10^6 cycles; the equivalent load on the bearing must be

- a) 9 kN b) 5 kN c) 7.5 kN d) 12 kN

84. Guest's theory of failure is applicable for which of the following type of materials

- a) brittle b.) ductile c.) elastic d.) plastic

85. Rankine's theory of failure is failure is applicable for which of the following type of materials

- a.) brittle b.) ductile c.) elastic d.) plastic

86. The fatigue life of a part can be improved by

- a.) electroplating b.) polishing c.) coating d.) shotpeening

87. Stress concentration in static loading is more serious in

- a.) ductile materials b.) brittle materials c.) equally serious in both cases d.) depends on other factors.

88. Stress concentration in cyclic loading is more serious in

- a.) ductile materials b.) brittle materials c.) equally serious in both cases d.) depends on other factors

89. The shock absorbing capacity of a bolt can be increased by

- a.) tightening it properly b.) increasing shank diameter c.) grinding the shank d.) using washer.

90. Which of the following key transmits power through frictional resistance only?

- a.) saddle key b.) kennedy key c.) barth key d.) tangent key

ANSWERS

71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
c	d	c	d	a	b	b	d	b	b	b	b	c	b	a	d	b	a	c	a

PART B

2 MARKS

91. Under what situation, bevel gears are used?[AU, NOV-07]

Bevel gears are used to transmit power between two intersecting shafts.

92. What are the advantages of spiral bevel gears over straight bevel gears?

Spiral bevel gears are smoother in action and quieter than straight bevel gears.

93. What is the difference between an angular gear and a miter gear? [AU MAY-13]

When the bevel gears connect two shafts whose axes intersect at an angle other than a right angle, then they are known as angular bevel gears.

When equal bevel gears connect two shafts whose axes intersect at right angle, then they are known as miter gears.

94. Why is the efficiency of worm gear drive comparatively low?

The efficiency of worm gear drive is lower because of power loss due to friction caused by sliding.

95. What are the forces acting on a bevel gear?[AU, MAY-09]

- Tangential force
- Axial force
- Radial force

96. Under what situation, worm gears are used? [AU NOV-08]

The worm gears are used to transmit power between two non-intersecting non-parallel shafts and for high speed ratios as high as 300:1

97. How can you specify a pair of worm gear?

A pair of worm gear are specified as:($z_1/z_2/q/m_x$)

Z_1 = number of starts on the worm

Z_2 = number of teeth on the worm wheel

q =diameter factor

m_x = axial module.

98. Differentiate self-locking and over running worm drives.

The drive is called self-locking, if $\mu \geq \cos \alpha \tan \gamma$

The drive is called overrunning, if $\mu < \cos \gamma \cdot \tan \gamma$

99. What is a crown gear? [AU MAY-10]

A bevel gear having a pitch angle of 90 degree and a plane for its path surface is known as a crown gear.

100. What kind of contact occurred between worm and wheel?

Meshing of wheel teeth and worm wheel occur with sliding action.

PART C

16 MARKS

101. Design a pair of bevel gear to transmit 10kW at a pinion speed of 1440rpm required transmission ratio is 4. Material for gears is 15Ni 2 Cr 1Mo 15/steel. The tooth profiles of the gears are of 20degree composite form. [AU, MAY-12]

102. Design a straight bevel gear drive between two shafts at right angles to each other. Speed of the pinion shaft is 36rpm and the speed of the gear wheel shaft is 120rpm. Pinion is of steel and wheel of cast iron. Each gear is expected to work 2hrs/day for 10yrs. The drive transmit 9.37kW.[AU, NOV-07]

103. A pair of worm gears is designed as 1/52/10/8. The worm transmits 800w power at 1000rpm and the normal pressure angle is 20degree. Find the coefficient of friction and the efficiency of the worm gears. Also find the power lost in friction.

104. A hardened steel worm rotates at 1440rpm, and transmits 12kW to a phosphor bronze gear. The speed of the worm wheel should be 60(+ or -)3% rpm. Design the worm gear drive if an efficiency of at least 82% is desired.[AU, MAY-09, AU MAY-13]

105. A steel worm running at 240rpm receives 1.5kW from its shaft. The speed reduction is 10:1. Design the drive so as to have an efficiency of 80%. Also determine the cooling area required, if the temperature rise is restricted to 45°celsius. Take overall heat transfer coefficient as 10w/m² c. [AU, MAY-12]

UNIT – IV DESIGN OF GEAR BOXES

PART A

1 MARK

106. Which of the following key is under compression rather than in being shear when under load?

- a. saddle b. feather c. barth d. kennedy

107. Tangent key transmits force in

- a. one direction only b. two directions c. both one and two directions
d. none of the above.

108. The key will fail in which of the following manner

- a. shearing b. crushing c. both crushing and shearing d. none of the above.

109. Shaft is subjected to which of the following stresses

- a. bending b. torsional c. both bending and torsional d. none of these

110. Feather keys are generally

- a. tight in shaft and loose in hub b. loose in shaft and tight in hub
c. tight in both shaft and hub d. loose in both shaft and hub

111. In the assembly of pulley, key and shaft

- a. pulley is made the strongest b. key is made the weakest
c. key is made the strongest d. all the three are designed for equal strength

112. during shearing failure of the key, the area under shear is

- a. length b. width c. both length and width d. length and thickness

113. A circular shaft can transmit a torque of 5 kN-m. If the torque is reduced to 4kN-m, then the maximum value of bending moment that can be applied to the shaft is

- a. 1kN-m b. 2kN-m c. 3kN-m d. 4kN-m

114. A shaft is subjected to fluctuating loads for which the normal torque and bending moment are 1000N-m and 500N-m respectively. If the combined shock and fatigue factor for bending is 1.5 and combined shock and fatigue factor for torsion is 2, then the equivalent fusing moment for the shaft is

- a. 2000N-m b. 2050N-m c. 2100N-m d. 2135N-m

115. The design calculations for members subjected to fluctuating loads with the same factor of safety yield the most conservative estimates when using

- a. gerber relation b. soderberg relation
c. goodman relation d. none of these

116. A transmission shaft subjected to bending loads must be designed on the basis of

- a. maximum normal stress theory b. maximum shear stress theory
c. maximum normal stress and maximum shear stress theories
d. fatigue strength

117. The piston rod of a steam engine is 50mm in dia and 600mm long. The distance of the piston is 400mm and the maximum steam pressure is 0.9N/mm². The young's modulus for the material of the piston rod is 210KN/mm². Maximum load acting on the piston due to steam will be

- a. 113.11kN b. 114.25kN c. 125kN d. 214.15kN

118. Compression of the piston will be

- a. 0.155mm b. 0.165mm c. 0.175mm d. 0.185mm

119. A wrought iron bar 50mm in diameter and 2.5m long transmits a shock energy of 100N-m, take $E = 200\text{GN/m}^2$, Maximum instantaneous stress will be

- a. 87.6N/mm² b. 89.6N/mm² c. 90.3N/mm² d. 92.3N/mm²

120. Elongation will be

- a. 1.11mm b. 1.12mm c. 1.13mm d. 1.14mm

121. A steel shaft 35mm in dia and 1.2m long held rigidly at one end has hand wheel 500mm in dia keyed to the other end. The modulus of rigidity of steel is 80GPa. The load applied tangent to the rim of wheel produces a torsional shear of 60MPa will be

- a. 2010N b. 2020 c. 2030N d. 2000N

122. Number of degrees with which the wheel will turn when calculated load applied is

- a. 0.03degree b. 0.04degree c. 0.05degree d. 0.06degree

123. A machine component is subjected to a flexural stress which fluctuated between +300MN/mm² and -150MN/mm². Take yield strength = 0.55 ultimate strength. Endurance strength = 0.5 ultimate strength, and f.o.s = 5, the value of minimum ultimate strength according to Gerber relation will be

- a. 921.6MPa b. 924.35MPa c. 932.9MPa d. 075.4MPa

124. The value of minimum ultimate strength according to modified goodman relation will be

- a. 100MPa b. 1025MPa c. 1050MPa d. 1075MPa

125. A hydraulic press exerts a total load of 3.5MN. This load is carried by two steel rods, supporting the upper head of the press. The safe stress is 85MPa and $E=210\text{kN/mm}^2$, diameter of rod will be

- a. 160mm b. 161mm c. 162mm d. 165mm

ANSWERS

106	107	108	109	110	111	112	113	114	115
b	a	c	c	a	b	c	c	d	b
116	117	118	119	120	121	122	123	124	125
a	a	b	c	c	b	c	b	c	c

PART B**2 MARKS****126. What situation demand use of gear boxes?**

Gear boxes are required wherever the variable spindle speeds is necessary.

127. Write any two required of a speed gear box?

Gear box should provide the designed series of spindle speed.

Gear box should transmit the required amount of power to the spindle.

128. List any two methods used for changing speeds in gear boxes.

- a. sliding mesh gearbox
- b. constant mesh gear box

129. What are preferred numbers?[AU, MAY-06]

Preferred numbers are the conventionally rounded off values derived from geometric series. There are five basic series, denoted as R5, R10, R20, R40 and R 80 series.

130. What is step ratio? [AU, MAY-10]

When the spindle speeds are arranged in geometric progression, then the ration between the two adjacent speeds is known as step ratio.

131. What does the ray diagram of gear box indicates?[AU, May- 06]

The ray diagram is a graphical representation of the drive arrangement in general form. It serves to determine the specific values of all the transmission ratios and speeds of all the shafts in the drive.

132. What is kinematic arrangement as applied to gear boxes?

The kinematic layout shows the arrangement of gears in a gear box. It also provides information like number of speeds available at each spindle and the number of stages used.

133. What is speed reducer?

Speed reducer is a gear mechanism with a constant speed ratio, to reduce the angular speed of output shaft as compared with that of input shaft.

134. State any three basic rules to be followed while designing a gear box.

- a. The transmission ratio (i) in a gear box by $\frac{1}{4} \leq i \leq 2$.
- b. For stable operation, the speed ratio of any stage should not be greater than 8 that is $N_{\max}/N_{\min} \leq 8$.
- c. In all stages except in the first stage, $N_{\max} \geq N_{\text{input}} > N_{\min}$.

135. What is the function of spacers in a gear box?[AU, MAY-07]

The function of spacers is to provide the necessary distance between the gears and the bearings.

PART C**16 MARKS**

136. A gear box is to be designed to provide 12 output speeds ranging from 160 to 2000rpm. The input speed of motor is 1600rpm. Choosing a standard speed ratio, construct the speed diagram and the kinematic arrangement. [AU, MAY-12]

137. Construct the speed diagram and the kinematic arrangement for an 18 speed gear box for following data: Motor speed = 1440rpm, min.output speed = 16rpm, max.output speed = 800rpm, arrangement = 2x3x3.[AU, NOV-08]

138. A 14 speed gear box is required to furnish output speeds in the range of 125 rpm to 2500rpm. Draw the speed diagram and the kinematic arrangement.

139. Design a 12 speed gear box for an all geared headstock of a lathe. Max and min. speeds are 600rpm and 25rpm respectively. The drive is from a electric motor giving 2.25kw at 1440rpm. [AU, MAY-12]
140. Design a gear drive to give 18speeds for a spindle of a milling machine. The drive is from a electric motor of 3.75kw at 1440rpm. Max. and min. speeds of the spindle are to be around 650 and 35rpm respectively.[AU,NOV-07]

UNIT – V DESIGN OF CAM, CLUTCHES AND BRAKES

PART A

1 MARK

141. The extension in each rod in a length of 2.5m will be
a. 1mm b. 1.012mm c. 2.012mm d. 1.251mm
142. A solid shaft is to transmit 20kW at 200rpm. The ultimate shear stress for the steel may be taken as 350MPa and a f.o.s as 8. Diameter of a solid shaft will be
a. 45mm b. 46mm c. 48mm d. 50mm
143. If a hollow shaft is to be needed in place of the solid shaft when the ratio of inside to outside dia is 0.5, then outer dia will be
a. 46mm b. 47mm c. 48mm d. 48.6mm
144. A cylindrical shaft is subjected to an alternating stress of 100MPa. Fatigue strength of sustain 1000cycles is 490 MPa. If the corrected endurance strength is 70MPa, estimated shaft life will be
a. 1071cycles b. 15000cycles c. 281914cycles d. 928643cycles
145. A steel bar of 40mm×40mm square cross section is subjected to an axial compressive load of 200kN. If the length of the bar is 2m and $E=200\text{GPa}$, the elongation of the bar will be
a. 1.25mm b. 2.70mm c. 4.05mm d. 5.40mm
146. A solid circular shaft of diameter 100mm is subjected to an axial stress of 50MPa. It is further subjected to a torque of 10 kN-m. The maximum principal stress experienced on the shaft is closest to
a. 41Ma b. 82MPa c. 164MPa d. 204MPa
147. If the principal stresses in a plane stress problem are stress one is 100MPa and stress two is 40MPa the magnitude of the maximum shear stress will be
a. 176.2 b. 196 c. 481 d. 981
148. A rod of length L and diameter D is subjected to a tensile load P. Which of the following is sufficient to calculate the resulting change in diameter?
a. Young's modulus b. shear modulus c. poisson's ratio d. both young's modulus and shear modulus
149. An axial residual compressive stress due to a manufacturing process is present on the outer surface of a rotating shaft subjected to bending. Under a given bending load, the fatigue life of the shaft in the presence of the residual compressive stress is
a. decreased b. increased or decreased, depending on the external bending load c. neither decreased nor increased d. increased
150. A solid circular shaft of dia 100mm is subjected to an axial stress of 50MPa. It is further subjected to a torque of 10KNm. The max. principal stress experienced on the shaft is closest

to

- a. 41MPa b. 82MPa c. 164MPa d. 204MPa

151. The temporary joints between the two metal plates is

- a. butt welding b. bolt and nut c. MIG d. TIG

152. The permanent joints between the two metal plates is

- a. bolt and nut b. welding c. hardening d. tempering

153. Square thread bolts are mostly used in

- a. screw jack b. vices c. lead screw d. power transmission devices

154. Hookes law holds good up to

- a. yield point b. elastic limit c. plastic limit d. breaking point

155. The ratio of linear stress to linear strain is called

- a. modulus of elasticity b. modulus of rigidity c. bulk modulus d. poisson's ratio

156. The ratio of the ultimate stress to the design stress is called

- a. FOS b. strain c. elastic limit d. bulk modulus

157. Failure of a material is called fatigue when it fails

- a. at the elastic limit b. below the elastic limit c. at the yield point d. below the yield point

158. Stress concentration factor is defined as the ratio of the

- a. max. stress to the endurance limit b. nominal stress to the endurance limit
c. max. stress to the nominal stress d. nominal stress to the max. stress

159. The neutral axis of a beam is subjected to

- a. zero stress b. max. tensile stress c. max. compressive stress d. max. shear stress

160. The standard length of the shaft is

- a. 5m b. 6m c. 7m d. all of these

161. A slot or recess in a shaft and hub of the pulley to accommodate a key is

- a. coupling b. key c. flange d. key way

162. To prevent the relative motion between shaft and hub of the pulley is used

- a. coupling b. key c. flange d. key way

163. The taper on the rectangular sunk key is

- a. 1 in 16 b. 1 in 32 c. 1 in 48 d. 1 in 100

ANSWERS

141	142	143	144	145	146	147	148	149	150				
b	c	d	c	a	b	c	d	d	b				
151	152	153	154	155	156	157	158	159	160	161	162	163	
b	b	a	b	a	a	d	c	a	d	d	b	a	

PART B

2 MARKS

164. What is the function of a clutch?

The clutch is a mechanical device which is used to connect or disconnect the source of power at the operator's will.

165. Name few commonly used friction material.(AU, may- 07,AU MAY-13)

wood, cork, leather, asbestos based friction materials, and powdered metal friction materials.

166. What is the function of a brake?

Brake is a mechanical device by means of which motion of a body is retarded for slowing down or to bring it to rest, by applying artificial frictional resistance.

167. Differentiate a brake and a dynamometer.

A dynamometer is a brake incorporating a device to measure the frictional resistance applied.

168. Give examples for radial and axial brakes.

Radial brake: Band brakes, block brakes, and internal expanding rim.

Axial brake: Cone brakes and disc brakes.

169. What are the types of brake linings? [AU, MAY-10]

a. Organic linings b. Semi-metallic linings c. Metallic linings

170. What is a self-locking brake?

When a frictional force is sufficient enough to apply the brake with no external force, then the brake is said to be self-locking brake.

171. What you meant by self-energizing brake?(AU, Dec- 05, AU MAY-13)

When the moment of applied force and the moment of the frictional force are in the same direction, then frictional force helps in applying the brake. This type of brake is known as a self-energizing brake.

172. Differentiate a brake and a clutch.[AU, MAY-07]

A clutch connects two moving members of machine, whereas a brake connects a moving member to a stationary member.

173. What factors should be considered for the design of cams?

A cam may be designed by assuming follower motion, and obtaining cam profile, follower motion, displacement, velocity and acceleration.

PART C

16 MARKS

174. A single plate friction clutch, with both sides of the plates being effective, is used to transmit power at 1440rpm. It has outer and inner radii 80mm and 60mm respectively. The maximum intensity of pressure is limited to 100000N/m^2 . If the coefficient of friction is 0.3, find a. total pressure exerted on the plate, and b. power transmitted. [AU, MAY-10, AU MAY-13]

175. Determine the time required to accelerate a counter shaft of rotation mass 500kg and radius of gyration 200mm to the full speed of 250rpm, from rest through a single clutch of internal and external radii 125mm and 200mm take $\mu=0.3$ and the spring force as 600N. Assume that only one side of clutch is effective. [AU, MAY-12]

176. A multi-disc clutch has three discs on the driving shaft and two on the driven shaft is to be designed for a machine tool, driven by an electric motor of 22kw running at 1440rpm. The inside diameter of the contact surface is 130mm. The maximum pressure between the surfaces is limited to 0.1N/mm^2 . Design the clutch. Take $\mu=0.3$, $n_1=3$, $n_2=2$. [AU, NOV-08]

177. A cone clutch with a semi-cone angle of 15degree transmits 10kw at 600rpm. The normal pressure between the surfaces in contact is not to exceed 1000kN/m^2 . The width of the friction surfaces is half of the mean diameter. Assume $\mu=0.25$. Determine i. the outer and inner diameter of the plate and ii. The axial force to engage the clutch. [AU, MAY-12]

178. A flywheel of mass 950kg and radius of gyration 300mm is rotating at 400rpm. It is brought to rest by means of a brake. The mass of the brake drum assembly is 4kg. The

specific heat of cast iron brake is 460j/kg. Assuming that the total heat generated is absorbed by the brake drum only, calculate the temperature rise. [AU, NOV-07]

179. In a band and block brake, the band is limited with 14 blocks, each of which subtends an angle of other to a pin 150mm from the fulcrum. Find the force required at the end of the lever 1m long from the fulcrum to give a torque of 4 KN-m. The diameter of the brake drum is 1m and the co.efficient of friction between the blocks and the drum is 0.25.

SUBJECT CODE: AT1360

SUBJECT NAME: AUTOMOBILE ENGINEERING

UNIT – I VEHICLE STRUCTURE AND ENGINES

Part – A

1marks

1. **The ratio between the speed of the camshaft and the speed of the crankshaft is**
 - a. 1:1
 - b. 1:4
 - d. 1:1/4
2. **In the torque converter, oil leaving the turbine is changed into a helping direction by curved**
 - a. Pump vanes
 - b. Stator vanes
3. **In the transmission system, the provision of slip joints allows a change in the**
 - a. Angle of drive
 - b. Length of shaft
4. **The function of a torque converter or fluid converter is similar to that of a**
 - a. Gear box
 - b. Clutch
 - d. Torsion box
5. **In the fluid coupling oil passes from the driving to the**
 - a. Gear
 - b. Coupling
 - d. Driven member
6. **The purpose of the fluid coupling is to act as a**
 - a. Automatic gear changer
 - b. Flexible power transmitting coupling
7. **In coil spring type of clutch the cover is separated by**
 - a. Removing three screws or nuts
 - b. Unhooking three retainer springs
 - d. Detaching three lever springs
8. **Pressing down on clutch pedal causes the release levers to move the pressure plate away from**
 - a. Friction disc
 - b. Clutch cover
 - d. Throw out bearing

- 9. The sun gear in the planetary gear system meshes with the**
 - a. Pinion cage
 - b. Ring gear
 - d. Planet pinions
- 10. The overdrive is located between the**
 - a. Transmission and the propeller shaft
 - b. Planetary gears and clutch
- 11. Synchronizing devices are designed to prevent gear clash when shifting into**
 - a. First and second
 - b. Second and high
- 12. Clutch noises are usually most noticeable when the engine is**
 - a. Being started
 - b. Decelerating
 - c. Accelerating
- 13. Clutch chattering or grabbing is noticeable**
 - a. At low speed
 - b. When engaging the clutch
 - d. During idle
- 14. Clutch slippage while clutch is engaged is particularly noticeable**
 - a. When starting the engine
 - b. During acceleration
 - d. At low speed
- 15. In gear systems, speed reduction means torque**
 - a. Stabilization
 - b. Increase
- 16. The power train includes the clutch, propeller shaft, differential and**
 - a. Steering gear
 - b. Front axles
 - d. Transmission
- 17. The part of the vehicle holds the passengers and the cargo to be transported is known as**
 - a. Hull
 - b. Chassis
 - d. Sedan
- 18. A double acting shock absorber usually has**
 - a. Unequal pressure acting on either sides'
 - b. Equal pressure on either side
- 19. The laminated spring, which is in common use, is of the type**
 - a. full elliptic
 - b. Semi elliptic
 - c. Three quarter elliptic
- 20. With a leaf spring type of suspension, interference between steering and suspension system can be reduced to minimum when**
 - a. Front end of the spring is pin joined and the rear end is shackled
 - b. Front end of the spring is shackled and rear end is pin jointed

c. Both ends of the springs are pin jointed

ANSWERS

1	2	3	4	5	6	7	8	9	10
b	b	a	a	d	b	a	a	d	b
11	12	13	14	15	16	17	18	19	20
b	c	d	b	b	d	a	a	b	b

Part – B

2marks

1. What is meant by self – propelled vehicle? (Au May 2007)

A vehicle producing power within itself for its propulsion is known as a self-propulsion is known as a self-propelled vehicle.

2. Give example to self – propelled vehicle?

Scooters, mopeds, cars, lorry, Bus, jeep, tractors, ship, aero planes, helicopters, rockets etc,

3. Mention any four requirements of an automobile.

1. It should develop power by itself.
2. The rate of power development must be easily controlled.
3. There should be an arrangement to transmit the power developed to the wheels.
4. An arrangement must exist to continue and discontinue power flow to the wheels.

4. What is meant by the term “chassis”? (Au May 2007)

It is the main structure of a vehicle which is used to the complex vehicle except the body. A vehicle without body is called a chassis.

5. Give any two requirements of good frame.

- a) Horizontal forces provided by road irregularities.
- b) Upward twisting forces caused by road shocks to provide a tensional effect.

6. What are the two types of water – cooling?

1. Thermo syphon system
2. Pump circulation system

7. What is meant by lubrication?

The process of reducing the friction between moving parts is known lubrication.

8. What is EGR? (Au May 2008) (AUMAY13)

The formation of excessive nitrogen oxides due to peak combustion temperature which is greater than 1950^oc is known as EGR.

9. What catalytic converter does?

The catalytic converter the pollutants like HC, CO and NO₂ into harmless gases. It oxidizes HC and CO into water and CO₂.

10. What is the term catalytic converter? (Au. April 2005,may2010]

The term catalytic converter covers the stainless steel box mounted in the exhaust system.

11. State the basis on which automobiles are classified. (AU MAY/JUNE 2012) (AU MAY/JUNE 2012)

12. What is the type of suspension used in heavy duty trucks? (AU MAY/JUN 2012)

13. What is the important property of lubricating oil? (AU MAY/JUNE 2012)

Part – C**16 Marks**

14. What are the different types of cooling systems and explain any two in detail. (AU MAY/JUNE 2012/NOV /DEC 2011)
15. Explain various accessories of the cooling system. (AU. May 2007)
16. Explain briefly about SI engine emission. (AU. May 2008)
17. What are catalytic converters? Explain the working principles of 3-way catalytic converter with chemical reaction. (AU. April 2006,may10] (AU MAY/JUNE 2012,NOV /DEC 2011)
18. Explain with neat sketch the various types of chassis and discuss their advantages & disadvantages. (AU MAY/JUNE 2012)
19. Explain the main forces which oppose the motion of a vehicle. (AU MAY/JUNE 2012)
20. Explain the effect of power to weight ratio on the performance of an automobile (AU MAY/JUNE 2012)(MAY13)

UNIT – II ENGINE AUXILIARY SYSTEM**Part – A****1marks****21. In a vehicle with torque tube drive, the rear suspension spring**

- a. Takes up driving thrust and torque reaction
- b. Supports load and takes up end thrust
- d. Takes up end thrust and torque reaction

22. The clips placed at intervals along some leaf spring to prevent spring leaf separation on rebound, are called

- a. Rebound clips
- b. Separation clips
- d. Relief clips

23. The device that permits variation in the distance between the spring eyes of a leaf spring as the spring flexes is called

- a. Spring shackle
- b. Spring U - bolt
- d. Spring leaf

24. Leaf spring for vehicles are nipped to

- a. To vary the effective length of the spring
- b. To increase the interleaf friction
- d. Ensure that all leaves are uniformly stressed during loading

25. On rebound, in the direct acting shock absorber, fluid flows out of the upper part of the cylinder and also

- a. Out of the dust shield
- b. Out of the reservoir
- d. Into the dust shield

26. The rear end suspension arrangement in which rear end torque is absorbed by the spring is called the

- a. Torque tube drive
- b. Hooks drive
- d. Hotchkiss drive

27. The purpose of the shock absorbers is to

- a. Strengthen frame
- b. Damp spring oscillations

28. X - member of a car frame ensures improved

- a. Resistance to side force due to transverse wind load
- b. Bending strength of side members
- d. Resistance of weaving and torsional strength of front end of frame

29. The central part of the axle beam is offset downwards to

- a. Give improved resistance to end thrusts during cornering
- b. Give better bending strength
- d. Clear the engine sump and lower vehicle centre of gravity

30. Pick out the one which does not belong to majority of items i.e; the odd thing

- a. Leaf spring suspension
- b. Coil spring suspension
- d. Air suspension

31. Which of the following factors is not related to the effect of independent front suspension

- a. reducing the unsprung masses
- b. reducing tyre wear
- d. Elimination of gyroscopic couples

32. The main function of the suspension system is best described as

- a. Reducing the body movement
- b. Reducing the accelerations to which the body is subjected

33. Helper springs are usually used

- a. In heavy vehicles in suspension system to obtain a two stage spring rate
- b. In vehicles to improve the load capacity of suspension system
- d. To stiffen the suspension

34. Parts of the brake system include brake-shoes and

- a. Master brake cylinder
- b. Engine cylinders

35. In the power steering assembly having four valves, two distribution and two reaction during neutral, or straight- ahead driving, all four valves are

- a. Fully closed
- b. Partly open

36. on the coaxial steering gear, the gear housing is lubricated

- a. From the hydraulic system
- b. From the worm housing

37. Turning the adjustment screw to make the over centre adjustment causes

- a. End-wise movement of the ball nut
- b. End-wise movement of the Pitman shaft
- d. End-wise movement of steering shaft

38. Air resistance to a car at 20 km/hr is R .The air resistance at 40 km/hr would be

- a. R
- b. 2R
- c. R²

39. Which one of the following is not a part of the chassis

- a. Wheels
- b. Front axle
- d. Passenger seats

40. in the linkage type of power steering system, the piston rod is attached at one end to

- a. A tie rod
- b. A connecting rod

ANSWERS

21	22	23	24	25	26	27	28	29	30
b	a	a	d	b	d	b	a	d	a
31	32	33	34	35	36	37	38	39	40
d	a	a	b	b	a	a	c	d	b

Part – B

2marks

1. What is carburetor? (Au Nov 2006 / NOV/DEC 2011)

The carburetor is a device used for atomizing and vaporizing the fuel and mixing it with the air in varying proportions to suit the changing operating conditions of vehicle engines.

2. What is meant by carburetion?

The process of breaking up and mixing the fuel with the air is called carburetion.

3. What are the functions of carburetor? (Au. Nov 2005)

1. It maintains a small reserve of petrol in the float chamber at a constant head.
2. It atomizes and vaporizes the fuel.
3. It prepares a mixture of petrol and air in correct proportions.
4. It supplies a fine spray of petrol.
5. It produces a homogeneous mixture.
6. It measure and supplies the proper quantity and proportions of air and fuel under all conditions of engine operations such as temperature, speed and load.

4. Mention the different circuits involved in Solex carburetor. (AU. Nov 2007)

1. Float circuit.
2. Starting circuit.
3. Idle and low speed circuit.
4. Normal running circuit.
5. Acceleration circuit.

5. State the important units of electronic fuel injection system.

- i) Fuel delivery system
- ii) Air induction system
- iii) Sensors and air flow control system
- iv) Electronic control unit

6. What is the function of a car's generator?

Generator is device which converts mechanical energy into elections energy. When it is rotated, it generates electricity by electro mechanical induction. It supplies electricity to the car.

7. **What is the purpose of Cut-out relay? (AU. Nov 2007)**
It prevents the reverse flow of current from the battery to the generator.
8. **What are the functions of relays?**
 - i. A voltage regulator to control the generated voltage.
 - ii. A current limiter to control the output current.
 - iii. Output relay to prevent reverse flow of current from the battery.
9. **What are the different types of ignition system? (AU. Nov 2008) (AUMAY13)**
 1. Coil ignition system or battery ignition system.
 2. Magneto ignition system.
 3. Electronic ignition system, and
 4. Transistorized ignition system.
10. **State the advantage of transistorized ignition systems. (AU. may 2010)**
 1. It increases the life of contact breaker points.
 2. It gives higher ignition voltage.
 3. It gives longer duration of spark.
 4. It has very accurate control of timing.
 5. Less maintenance.
11. **What are the advantages of a common rail direct injection system? (AU MAY/JUNE 2012)**
12. **What is meant by turbo charging? (AU MAY/JUNE 2012)**
13. **What are the uses of battery and motor in automobiles? (NOV/DEC 2011)**

Part – C**16 Marks**

1. What are the functions of carburetor? (AU April 2006)
2. Sketch and explain the construction and operation of a simple carburetor. (AU MAY2010, NOV/DEC 2011)
3. Explain the principle of operation of a carburetor used in two wheelers with a sketch. (AU Nov 2006)
4. Describe the working of a carter carburetor with a neat sketch.
5. Explain with a sketch the working of an electronic fuel injection system (any one type). (AU April 2005)
6. Describe the working of a lead acid battery with its neat sketch.
7. Draw a typical ignition coil and name the parts. (AU Nov 2006)
8. Draw the layout of a battery ignition system and mention the function of each component. (AU Nov 2005)
9. Explain the following of an injector of a common rail diesel injection system. (AU MAY/JUNE 2012)
10. **What are the types of electronic ignition systems? Describe any one of them clearly. (AU MAY/JUNE 2012)**
11. **Describe with neat sketch the working of a three unit regulator used in automobile. (NOV/DEC 2011)**

UNIT – III (TRANSMISSION SYSTEM)**Part – A****1marks**

41. As the steering wheel is turned a worm gear on steering shaft causes the end of the.....
To swing toward one side or the other of the car
- a. King pin
 - b. Steering gear

42. in the linkage type of power steering system, the swinging end of the pitman arm actuates

- a. A spool valve
- b. A tie rod
- d. An idler lever

43. In the constant control power steering unit the spool valve is moved by

- a. A pivot lever
- b. A valve rotor

44. In the coaxial power steering unit, the spool valve

- a. Rotates
- b. Moves end-wise

45. In the Saginaw rotary valve unit, rotation of the valve spool from the neutral position results in application of hydraulic oil pressure from the oil pump to one or the other and of the

- a. Pitman arm
- b. Connecting rod
- d. Disc clutch

46. in the Saginaw in line unit, end-wise movement of the valve spool is caused by reaction between the

- a. Worm and ball nut
- b. Piston and valve

47. in the Saginaw in line power steering unit, the valve spool is centered in neutral by

- a. Canter springs
- b. Oil pressure
- d. Torsion bar

48. Three types of oil pumps used in power steering system are vane, roller and

- a. Shoe
- b. Slipper

49. The two basic types of power steering system are

- a. Integral and valve
- b. Booster and power

50. In the steering gear of the linkage connecting to the wheel, steering knuckle, a gear sector, stud or toothed roller is meshed with

- a. A worm
- b. A ball bearing

51. The steering gear is a device for converting the rotary motion of the steering wheel into

- a. To and fro movement
- b. Up and down movement

52. in the steering gear, a gear sector or toothed roller is meshed with

- a. A Worm
- b. A ball bearing
- d. Steering wheel

53. The only time the steering wheel requires replacement would be

- a. Wheel bearing replacement
- b. An accident

- 54. As the steering wheel is turned a worm gear on the steering shaft causes the movement of the**
- King pin
 - Steering gear
- 55. The only service that a steering linkage normally requires is**
- Tie-rod adjustment
 - Lubrication
- 56. The Pitman arm in the steering gear is linked to the front wheels through the**
- Worm
 - Steering wheel
 - Steering shaft
- 57. Toe-in is adjusted by**
- Adding or removing shims
 - changing the effective length of the tie rods
- 58. The backward tilt of the centre line of the ball joints from the vertical is called**
- Positive caster
 - Negative caster
 - Negative camber
- 59. The point at which the centre line of the wheel and the centre line of the ball joints cross is called the point of**
- Intersection
 - Departure
- 60. The inward tilt of the centre line of the ball joints is called**
- Caster
 - Camber
 - Toe-out

ANSWERS

41	42	43	44	45	46	47	48	49	50
b	b	b	a	d	b	d	b	b	a
51	52	53	54	55	56	57	58	59	60
a	a	b	b	b	d	b	a	a	d

Part – B**2marks****61. What is a clutch?** (Au April 2005, NOV/DEC 2011)

Clutch is a mechanism used to connect or disconnect the engine from the rest of transmission elements.

62. What are the functions of clutch? (Au Nov 2005)

- To permit engagement or disengagement of a gear when the vehicle is stationary and the engine is running.

2. To transmit the engine power to the rear wheels smoothly without shocks to the transmission system while the vehicle is in motion.
 3. To permit the engaging of gear when the vehicle the vehicle is in motion without damaging the gear wheels.
- 63. What do you mean by fluid flywheel?** (AU Nov 2006)
The member which couples the driving member with driven member through a media of fluid is known as fluid coupling.
- 64. Define traction effort.** (AU April 2007)(AUMAY13)
The torque available on the wheel produces a driving force which is parallel to the road known as tractive effort.
- 65. What is the function of synchromesh unit in a gear box?** (AU April 2005)
To simplify the operations of changing gears without the occurrence of clashes and their consequent damage, a synchromesh gearbox is used in different types of motor vehicles.
- 66. What is an overdrive? Where it is exactly located?**
Overdrive is a device which is used to step up the gear ratio in the car. It is mounted in between transmission and propeller shaft.
- 67. What is propeller shaft? Where it is located?** (AU April 2005)
The propeller shaft is connected between the transmission shaft called gearbox output shaft and pinion shaft called input shaft of the differential at the wheel axle.
The propeller shaft is also called driveline shaft or drive shaft.
- 68. What is the function of universal joint in a propeller shaft?**
It is used to connect propeller shaft and gear box shaft and to provide between propeller shaft and gear box during transmission of rotary motion.
- 69. List down the types of live rear axles.** (Au Nov 2005)(AUMAY13)
1. Semi-floating
 2. Three – quarter floating, and
 3. Full – floating.
- 70. Where planetary transmission is used in automobile?** (NOV/DEC 2011)
- 71. What is a transfer case?** (MAY/JUNE 2012)
- 72. What is Hotchkiss drive?** (MAY/JUNE 2012)

Part – C**16 Marks**

- 73.** What is meant by clutch? List out the requirements. (AU Nov 2005) (NOV/DEC 2011)
- 74.** Explain the working of a single plate clutch with a diagram.(Au Apr 05,06)
- 75.** Explain the working principle of fluid fly wheel with the help of a sketch. (Au may 2005) (MAY/JUNE 2012)
- 76.** What is meant by a fluid coupling and torque converter?
- 77.** What is the difference between a fluid coupling and torque converter? (AU April 2005)
- 78.** Explain the sliding mesh gearbox with a suitable sketch. (AU may1 2005)
- 79.** Explain the operation of a sliding mesh gearbox and deduce the gear ratios. (Au April 2006)
- 80.** Discuss the construction and operation of a constant mesh gear box. (AU Nov 05)
- 81.** Draw a neat sketch of a differential with a neat sketch. (AU Nov 2005) (MAY/JUNE 2012)
- 82.** Explain the principle and working of a differential with a neat sketch. (AU April 2006)
- 83.** Explain the mechanics of Hotchkiss drive and torque tube drive. (NOV/DEC 2011)

UNIT – IV STEERING BRAKES AND SUSPENSION**Part – A****1marks**

84. Wheel camber helps to

- a. enable the driver to feel straight ahead position
- b. Reduce the bending stress on the stub axle and king pin
- d. Make it safer for the vehicle to take corners

85. When the top of the king pin is tilted towards the driver, the phenomenon is known as

- a. Negative caster
- b. Positive caster
- d. Skidding

86. The drawing in of the front wheels in front so that the distance between the front ends is slightly less than that between the back ends is known as

- a. Toe-out
- b. Roll-out
- d. Roll-in

87. When the front wheels are not parallel to each other and moved further away at the top, it is termed as

- a. Positive camber
- b. Negative camber
- d. Roll out

88. When the front wheels are closer at the top it is termed as

- a. Toe-in
- b. Toe-out
- d. Positive camber

89. Positive caster tends to make the front wheels

- a. Toe in
- b. Toe out

90. The inward tilt of king pin is called

- a. Caster
- b. Camber
- d. Toe-out

91. Tilting of the front wheels away from the vertical is called

- a. Camber
- b. Caster
- d. Toe-out

92. Caster action on the front wheels of a vehicle will

- a. Make it easier to take corners
- b. Reduce the load on the king pins
- d. Enable the driver to feel straight wheel position

93. In front end geometry factors that are involved include

- a. Camber
- b. Caster
- d. Toe-out

94. Toe-out on turns means that the right wheel in a right hand turn would turn-out or away from straight ahead

- a. More than the left wheel
- b. Less than the left wheel

95. Positive caster will tend to cause the car to

- a. Roll out on turns
- b. Bank on turns

96. The backward tilt of the king pin from the vertical is called

- a. Positive caster
- b. Negative caster
- d. Negative camber

97. When the point of intersection of the centre line of the wheel and the centre line of the king pin cross is below the road surface, then the front wheel will tend to

- a. Toe-out
- b. Toe-in

98. The point at which the centre line of the wheel and the centre line of the king pin cross is called

- a. included angle
- b. Point of departure
- d. Point of included angle

99. The inward tilt of the king pin is called

- a. Caster
- b. Camber
- d. Included angle

100. The tilting of the front wheels away from the vertical is called

- a. Camber
- b. Caster
- d. Toe-out

101. Camber angle plus king pin inclination angle is called the

- a. Caster
- b. Included angle
- d. Toe-out

102. Too much toe-in will be noticed by

- a. Excessive tyre wear when cornering only
- b. Steering wander
- d. Light steering

103. The Ackermann steering layout

- a. Makes for safer driving
- b. Enables the driver to feel ahead position
- d. Reduces load on the kingpins and stub axles

ANSWERS

84	85	86	87	88	89	90	91	92	93
d	b	d	a	d	a	d	a	d	a
94	95	96	97	98	99	100	101	102	103
a	a	a	a	d	d	a	b	d	a

Part – B**2marks**

1. **How is power developed in automobiles?** (Au may 2006)
The power is transferred to rear axle through clutch, gearbox, propeller shaft and differential unit.
2. **Define the following terms.** (Au Nov 2005)
 - a) Wheel center
 - b) Inset wheel
 - c) Outset wheel , and
 - d) Half dual spacing
3. **Classify wheels**
 1. Disc wheel
 2. Wire wheel
 3. Split wheel
 4. Light alloy wheel
4. **What are the advantages of wire wheel over disc wheel?**
 1. It is in weight
 2. It has high strength
 3. It provides better cooling of brakes drum
 4. It is very easy to change the wheel.
5. **What are requirements of tyres?** (AUMAY13)
 1. The tires should be also to carry the whole of the vehicle.
 2. It should absorb the shock loads while running on the road.
 3. The tires should not skid even on wet roads. So, they should develop uniform wear to reduce skid.
 4. The tires should have be minimum as far as possible.
6. **Write down the types of tread patterns in typres.** [Au may2010]
 1. Rib pattern
 2. Lug pattern
 3. Rib-and-Lug pattern
 4. Block pattern
7. **What are cross ply and radial ply tyres?** (AU April 2006)
In cross-ply tyres, the piles are placed one over the other such that their cords make angle from 40° to 45° to the tyre axis.
8. **Define tube vulcanizing.**
The process of repairing a punctured tube is known as tube vulcanizing.
9. **What is meant by camel block?**
Fresh tread material known as 'Camel Black' is placed around the tread and put in retreading machine and clamped.
10. **Classify wheel balancing.**
 1. Static balance, and
 2. Dynamic balance
11. What are the functions of brake lining? (MAY/JUNE 2012)
12. What is steering ratio? (MAY/JUNE 2012)
13. What is the purpose of shock absorber? (NOV / DEC 2011)

Part – C**16 Marks**

1. What are the different types of wheels? Discuss their relative merits.(AU Nov 05)
2. What is castor, camber and King pin inclination with respect to wheel geometry? (AU MAY 2010)
3. List down the various components of a steering system. (AU MAY 2005/ MAY/JUNE 2012, NOV/DEC 2011)
4. What are the different types of steering gears used in an automobile? (AU April 2006)
5. Explain the operation of a sliding mesh gearbox and deduce the gear ratios. (AU April 05, April 06)
6. With a neat diagram explain the construction and operation of a shock absorber. (AU April 2006)
7. Explain the operation of a telescopic type shock absorber with a sketch.
8. What is the advantage of independent suspension system? (AV April 2005)
9. Explain the construction and operation hydraulic braking system with a sketch. (AU Nov 05, April 06 ,NOV/DEC 2011)
10. What is the difference between dead front axle and live front axle? (MAY/JUNE 2012)(AUMAY13)

UNIT – V ALTERNATE FUELS / POWER PLANTS

Part – A

1marks

81. Caster is defined as the inclination of

- a. Front wheel to the vertical
- b. The king pin axis in the fore and aft plane
- d. The axis of stub axle to the horizontal

82. Toe out on turns

- a. Is adjusted by shims
- b. Is adjusted by changing the effective length of the tie rods

83. Weight can be attached to wheel rim to correct

- a. Wheel alignment
- b. Wheel run out

84. Wheels must be balanced

- a. On the car only
- b. Either on or off the car

85. When an automobile takes a turn to avoid the skidding and overturning

- a. Each wheel will roll independently
- b. Front two wheels will have a common centre during a turning

86. The distance between dual tyres of vehicles is to be correctly spaced to

- a. Ensure proper distribution of load between dual wheels
- b. Reduce over-steering effect
- d. Ensure effective braking

87. To equalize tyre wear, it is suggested that tyres be rotated from one wheel to another every

- a. 80 kms
- b. 8000 kms

88. Of the four tyres on a car, the one that wears most is the

- a. Right front tyre
- b. Right rear tyre
- d. Left rear tyre

89. If a tube of large size than required is installed in a tyre then

- a. The tyre will over expand
- b. The tyre and tube will not fit the rim

90. For a thorough inspection a tyre should be

- a. On the car
- b. On the wheel
- c. On Airplane
- d. Inflated

91. The radius of a pneumatic tyre is

- a. The radius of unloaded fully inflated tyre
- b. The height of centre of tyre from the ground when it is loaded
- d. It is fixed radius, based on the dimensions of the tyre

92. In the hydraulic brake system, movement of a piston in the master cylinder produces hydraulic pressure which causes movement of the

- a. Wheel cylinder pistons
- b. Brake pedal

93. Movement of the brake pedal forces brake fluid from the master brake cylinder through brake lines and into the

- a. Brake shoes
- b. Wheel cylinders
- d. Pedal rod

94. The working fluid normally used in hydraulic brake systems is

- a. High speed diesel oil along with alcohol
- b. SAE 20 oil with anti-corrosion additives
- d. A solution of castor oil in alcohol along with neutralizer

95. In the case of brake linings saturates and bonding materials are used to

- a. Facilitate moulding and curing of brake linings
- b. To improve the heat dissipating capacity of linings
- d. To make the lining material impervious to moisture and oil and to ensure a steady coefficient of friction up to 3000 C

96. In the hydraulic brake system, the movement of a piston in the master cylinder produces hydraulic pressure which causes movement of

- a. Brake shoe
- b. Brake pedal

97. As the load on the vehicle increase it demands

- a. Increased braking torque
- b. Decreased braking torque

98. The approximate ratio of effort applied Ans : effort available from servo system is

- a. 1Ans : 1
- b. 3Ans : 1
- d. 10Ans : 1

99. In a vacuum type servo-assisted brake system, vacuum is available in..... is made use of

- a. Exhaust manifold
- b. Combustion chamber
- d. Inlet manifold

100. In jeeps we use

- a. Mechanical brakes
- b. Hydraulic brakes

ANSWERS

81	82	83	84	85	86	87	88	89	90
d	b	b	b	b	d	b	b	b	d
91	92	93	94	95	96	97	98	99	100
a	a	b	d	a	a	a	b	d	b

Part – B**2marks****101. What are the alternative fuels available? (AU MAY 2006)**

Nature Gas, LPG, Biodiesel, Gasohol, Hydrogen, Electricity, and fuel cells

102. Define volatility.

Volatility indicates a fuel's ability to vaporize under different temperature and pressures.

103. Define flame speed.

The speed at which a flame front propagates through a fuel/air mixture can affect engine performance and emissions.

104. Which gas has the highest ignition temperature?

Hydrogen has the highest auto-ignition temperature at about 1,065^oF.

105. What is the composition of nature gas? (Au Nov 2005 , Nov 2007)

Nature is at least 88% methane with the balance being higher weight hydrocarbons.

106. List out the various forms of nature gas. (AUMAY13)

Methane, Ethane, Methanol, Ethanol, Reformulated and Oxygenated gasoline

107. How is biodiesel prepared?

The majority of biodiesel is made is made from soybean or canola oils, out it is also made from waste stream sources such as used cooking oils or animal fats.

108. What does B100 refer? (Au Nov 2009)

B100 – 100% biodiesel offers the most overall environment benefits. Use of B100 may require engine or fuel system component modification and can cause operating problems, especially in cold weather.

109. What is meant Gasohol? (Au April 2008) (AUMAY13)

Gasohol is a mixture of one part ethanol (commonly known as grain alcohol or beverage alcohol) and nine parts unleaded gasoline.

110. What is meant by a fuel cell and how it works? (Au April 2006, April 2008)

A fuel cell produces electricity directly from the reaction between hydrogen (derived from a hydrogen-containing fuel or produced from the electrolysis of water) and oxygen from the air.

Part – C**16 Marks**

111. Describe various alternate fuels available in detail.

112. Explain the various properties of alternative fuels.

113. Explain the production of nature gas with a neat sketch in details.

114. Explain the various significance of CNG conversion kit used in S.I. engines. (Au Nov 2005 , Nov 2007) (AUMAY13)

115. Explain the fuel character tics Alcohols, CNG, LPG and hydrogen. (Au may'10)

116. Describe the salient feature of using LG as an alternate fuel. (Au Apr'06)

117. Explain why Hydrogen is considered as the most favorable fuel for future. (Au April 2006)

118. Discuss the properties of hydrogen. (Au Nov 2005)

119. What are the advantages and limitations of Electric vehicle? (Au Apr'05)(NOV/DEC 2011)
120. Explain the working of hybrid fuel cells.
121. Explain the principle of operation of a series hybrid electric vehicle with a sketch. (Au April 2005, Nov 2006)
122. Discuss the principle of operation of a fuel cell with a neat sketch. (Au April 2008, Nov 2008)
123. Explain briefly the applications of fuel cells.(AUMAY13)
124. Discuss in detail about Indian and euro emission standards.)(NOV/DEC 2011)
125. Explain the advantages of a hybrid and fuel cell vehicles. (MAY / JUNE 2012)
126. Discuss the performance and emission characteristics of a C.I engine fuelled with bio-diesel and diesel blends) (NOV/DEC 2011)(AUMAY13)

SUBJECT CODE: ME2353

SUBJECT NAME: FINITE ELEMENT ANALYSIS

UNIT I FINITE ELEMENT FORMULATION OF BOUNDARY VALUE PROBLEMS

PART A (1 MARK)

1. Which one of the following is required for designing and assembling the products by an analyst_____
- (A) Stress distribution (B) natural frequencies (C) vibrations (D) All of these
2. _____ is the one of the methods used for engineering analysis
- (A) Numerical methods (B) approximate methods (C) both (A) & (B) (D) none of these
3. _____ is the small units having definite shape of geometry and nodes
- (A) Indefinite element (B) infinite element (C) finite element (D) one dimensional elements
4. The modern development of the finite element method in the field of structural engineering is done by_____ (A) Levy (B) turner (C) Gallagher (D) hrenniikoff
5. The art of sub dividing a structural in to a convenient number of smaller components is known as_____
- (A) Preprocessing (B) analyzing (C) discretization (D) post processing
6. _____ is the basis of finite element method
- (A) Preprocessing (B) analyzing (C) post processing (D) discretization
7. A finite element has a specific structural shape & is interconnected with the adjacent elements is given by_____
- (A) Nodes (B) element in truss (C) bar element (D) none of these
8. In _____ temperature s or fluid pressure at each nodal point is obtained. (A) Structural element (B) finite element (C) non-structural problems (D) structural problems
9. _____ is one of the named variation methods.
- (A) Point collection method (B) galerkins method (C) least square method (D) none of these
10. Analysis & evaluation of the solution result s referred to as_____
- (A) Preprocessing (B) analyzing (C) post processing (D) stiffness
11. The process of uniting the various elements together is called_____
- (A) Degrees of freedom (B) discretization (C) assemblage (D) aspect ratio
12. _____ is defined as the ratio of the largest dimension of the element to the smaller dimension
- (A) Degrees of freedom (B) discretization (C) assemblage (D) aspect ratio

13. The truss elements transmit only _____ to the element

- (A) Radial force (B) axial force (C) all of these (D) none of these

14. The solution of the problem does not vary with time is known as _____

- (A) Dynamic analysis (B) static analysis (C) global analysis (D) local analysis

15. _____ is the FEA software

- (A) ANSYS (B) NASTRAN (C) COSMAS (D) ALL OF THESE

16. Which one of the following satisfies the properties of stiffness matrix?

- (A) The sum of elements in any column must equal to zero. (B) All members are pin jointed
(C) The sum of shape function is equal to zero. (D) None of these

17. _____ force is defined as distributed force acting on the surface of the body

- (A) Tangential force (B) Point load (C) Traction force (D) All of these

18. Why the polynomials are used as shape function

- A.) Differentiation and integration are quite easy
B.) The accuracy of the result can be improved by increasing the order of the elements
C.) It is easy to formulate and computerize the finite element equations.
D.) All of these

19. The finite element modeling consists of the following

- (A) Finite shape (B) Infinite Shape
(C) Discretization and numbering of nodes (D) None of these

20. A _____ is defined as a structure, made up of several bars, riveted or welded together

- (A) Bar (B) Beam (C) Truss (D) None of these

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
D	C	C	D	C	D	A	C	D	B	C	D	B	B	D	A	C	D	C	c

PART-B

(2 MARKS)

21. Give examples for the finite element.

- One dimensional elements: (a) Truss elements. (b) Bar, Beam elements.
- Two dimensional elements: (a) Triangular elements.
(b) Rectangular elements.
- Three dimensional elements: (a) tetrahedral elements.
(b) Hexahedral elements.

22. What is meant by node or joint?

Each kind of finite element has a specific structural shape and is interconnected with the adjacent elements by nodal points or nodes. At the nodes, degrees of freedom are located. The forces will act only at nodes and not at any other place in the element.

23. What is the basis of finite element method? (AU DEC 2009)

Discretization is the basis of finite element method. The art of subdividing a structure, into a convenient number of smaller components is known as discretization.

24. What are the types of boundary conditions?

There are two types of boundary conditions.

They are:

- Primary boundary condition.
- Secondary boundary condition.

25. State the three phases of finite element method.

The three phases are:

1. Preprocessing.
2. Analysis
3. Post processing.

26. What are structural and non-structural problems?

Structural problems: In structural problems, displacement at each nodal point is obtained. By using these displacement solutions, stress and strain in each element can be calculated.

Non-structural problems: In non-structural problems, temperatures or fluid pressure at each nodal point is obtained. By using these values, properties such as heat flow, fluid flow, etc., for each element can be calculated.

27. What are the methods generally associated with the finite element analysis? (AU MAY 2008)

The following two methods are generally associated with the finite element analysis. They are:

- (i) Force method.
- (ii) Displacement or stiffness method.

28. What is meant by post processing?

Analysis and evaluation of the solution results is referred to as Processor computer programs help the user to interpret the results by displaying them in Graphical form.

29. Name the weighted residual methods.

1. Point collocation method.
2. Sub domain collocation method.
3. Least squares method.
4. Galerkin's method.

30. What is Rayleigh-Ritz method? (AU MAY 2007)

Rayleigh-Ritz method is an integral approach method which is useful for solving complex Structural problems encountered in finite element analysis. This method is possible only if a suitable functional is available.

31. What is meant by discretization and assemblage? (AU MAY 2013)

The art of subdividing a structure into a convenient number of smaller components is known as discretization. These smaller components are then put together. The process of uniting the various elements together is called assemblage.

32. What is meant by degrees of freedom? (AU MAY 2009)

When the force or reaction act at nodal point node is subjected to deformation. The "deformation includes displacement, rotations, and/or strains. These are collectively known as degrees of freedom.

33. What is "Aspect ratio"? (AU MAY 2013)

Aspect ratio is defined as the ratio of the largest dimension of the element to the smallest dimension. In many cases, as the aspect ratio increases the inaccuracy of the solution increases. The conclusion of many researches is that the aspect ratio should be close to unity as possible.

34. What is truss element?

The truss elements are the part of a truss structure linked together by point joints, which transmit only axial force to the element.

35. List out two advantages of post-processing. (AU DEC 2010)

1. Required result can be obtained in graphical form.
2. Contour diagrams can be used to understand the solution easily and quickly.

36. What are 'h' and 'p' versions of finite element method?

'h' versions and 'p' versions are used to improve the accuracy of the finite element Method. In 'h' versions, the order of polynomial approximation for all elements is kept constant and the number of elements is increased. In 'p' version, the number of elements is maintained constant and the order of Polynomial approximation of element is increased.

37. During discretization, mention the places where it is necessary to place a node? (AU MAY 2010)

The following places are necessary to place a node during discretization process.

- (i) Concentrated load acting point
- (ii) Cross-section changing point.
- (iii) Different material interjection point.
- (iv) Sudden change in load point.

38. What is the difference between static and dynamic analysis?

Static analysis: The solution of the problem does not vary with time is known as static analysis.

Example: Stress analysis on a beam.

Dynamic analysis: The solution of the problem varies with time is known as dynamic analysis.

Example: Vibration analysis problems.

PART-C

(16 MARKS)

39. List and briefly describes the general steps involved in FEA.

40. Explain the discretization process.

41. Explain the following: a) Variation approach. b) Weighted residual methods.

42. A cantilever beam is shown in figure. It is subjected to an UDL 'W', point load W and moment M_0 at the free end as shown. (AU MAY 2008)

43. A SSB is subjected to UDL over entire span. Determine the bending moment and deflection at mid span by using Rayleigh-Ritz method and compare with exact solutions.

44. A beam AB of span 'l' simply supported at ends and carrying a point load W at the centre 'C' as shown in fig. Determine the deflection at midspan by using Rayleigh-Ritz method and compare with exact result. (AU DEC 2009)

45. A SSB subjected to UDL over entire span and it is subjected to a point load at centre of the span. Calculate the bending moment and deflection at midspan by using Rayleigh-Ritz method and compare with exact solution. . (AU, MAY 2013)

46. A bar of uniform cross section is clamped at left end at other end free and it is subjected to a uniform axial load P as shown in figure. Calculate the displacement and stress in a bar by using two terms polynomial and three terms polynomial. Compare with exact solutions.

47. The following differential equation is available for a physical phenomenon. $D^2y/dx^2 = 0$, $0 \leq x \leq 10$, Trial function is $y = a_1x(10-x)$ Boundary conditions are, $y(0) = 0$, $y(10) = 0$. Find the value of the parameter a_1 by the following methods. (i) point collocation; (ii) Subdomain collocation; (iii) Least squares; (iv) Galarkin. (AU, MAY 2010)

48. A linear elastic spring is subjected to a force of 1000N as shown in fig. Calculate the displacement and the potential energy of the spring.
49. Consider a 1 mm diameter, 50mm long aluminium pin-fin as shown in fig. Used to enhance the heat transfer from a surface wall maintained at 300°C. Calculate the temperature distribution in a pin fin by using Rayleigh-Ritz method. Take, $k=200\text{w/m}^\circ\text{C}$ for aluminium $h=20\text{ w/m}^\circ\text{C}$, $T_\infty=30^\circ\text{C}$.
50. Using Rayleigh-Ritz method, determine the expression for displacement and stress in a fixed bar subjected to axial force P as shown in fig. Draw the displacement and stress variation diagram. Take three terms in displacement function.
51. The differential equation of a physical phenomenon is given by $d^2y/d^2x + 500x^2 = 0$; $0 \leq x \leq 1$. By using the trial function, $y = a_1 (x - x^3) + a_2 (x - x^5)$, calculate the value of the parameters a_1 and a_2 by the following (i) Point collocation; (ii) Subdomain collocation; (iii) Least squares; (iv) Galarkin. The boundary conditions are: $y(0) = 0$, $y(1) = 0$.
52. Find the deflection at the centre of a simply supported beam of span length 'l' subjected to uniformly distributed load throughout its length as shown in fig. using (i) Point collocation; (ii) Subdomain collocation; (iii) Least squares; (iv) Galarkin.

53. Find the deflection at the centre of a clamped beam subjected to uniformly distributed load throughout its length as shown in fig. use point collocation method. Take trial function as $y = a(x^5 - 2lx^4 + l^2x^3)$.

54. The spring assembly is shown in fig. Assemble the finite element equation by using direct approach and potential energy approach.

55. Determine the displacements of nodes 1 and 2 in the spring system shown in fig. Use minimum of potential energy principle to assemble equations of equilibrium.

UNIT II

ONE DIMENSIONAL FINITE ELEMENT ANALYSIS

PART- A

(1 MARK)

56. Modulus of rigidity is defined as the ratio of

- (a) leaner stress due to longitudinal stress (b) stress to volumetric strain
(c) shear stress to shear strain (d) stress to strain (e) stress to longitudinal strain

57. A structure, made up of several bars, joined together is known as

- (a) beam (b) column (c) strut (d) tie (e) frame

58. Thin cylinders are used to store

- (a) water (b) oil (c) gas (d) steam (e) any one of the above

59. The ratio of maximum shear stress to maximum normal stress at any point in a solid circular shaft

- (a) 1 (b) 1/2 (c) 2 (d) 2/3 (e) 3/2

60. Mohr's circle can be used to determine the following stress on inclined surface

- (a) principal stress (b) normal stress (c) tangential stress
(d) maximum shear stress (e) all of the above

61. A large cylindrical vessel was sealed in summer what is likely to happen to in winter

- (a) nothing (b) explode (c) buckle and collapse (d) become lighter
(e) seal will get loosened

62. Unit of strain are

- (a) dimensionless (b) cm/cm (c) kg/cm²/cm (d) kg/cm (e) none of the above

63. A cylindrical bar of L meters deforms by l cm. the strain in bar is

- (a) l/L (b) 0.1l/L (c) 0.01l/L (d) 100l/L (e) none of the above

64. A composite bar made up of steel and copper is heated up the stress developed in steel and copper will be

- (a) compressive and tensile (b) compressive and bending (c) bending and tensile
(d) tensile and compressive (e) tensile and torsional

65. A structural member is subjected to an axial compressive force is called

- (a) beam (b) column (c) frame (d) strut (e) structure

66. Torsion bars are in series

- (a)if same torque acts in each apporioned between them
(b)if they have equal angle of twist and an applied torque
(c)are not possible
(d)if there ends welded together
(e)none of the above

67. The ratio of maximum shear stress to the average shear stress in case of a circular beam transmitting power is equal to

- (a)3/2 (b)4/3 (c)7/4 (d)2 (e)5/2

68. The ratio of maximum shear stress to the average shear stress in case of a rectangular beam subjected to torsion is

- (a)3/2 (b)4/3 (c)7/4 (d)2 (e)5/2

69. Compression members tend to buckle in the direction of

- (a)axis of load (b)perpendicular to axis of load (c)minimum cross section
(d)least radius of gyration (e)unpredictable

70. Moment of inertia of an area is always least with respect to

- (a)bottom-most axis (b) radius of gyration (c)central axis (d)centradial axis
(e) none of the above

71. Section modulus Z is expressed as

- (a) I/y (b)E/I (c) M/I (d)EI (e) I_y

72.If the section of the beam is increases, then bending stress will

- (a)decrease (b) increase (c) remain same (d)there is no such correlation
(e) none of the above

73. If the load at free end on a cantilever is increased so us to cause rupture, same will occur

- (a)below the load (b)at fixed end (c)between fixed end and centre
(d) at centre (e) between center and free end

74. Strength of a beam is directly proportional to its

- (a)length (b)breath (c)width (d)moment of inertia (e) all of the above

75. Strength of a beam is directly proportional to the square of its

- (a)length (b)breath (c)width (d)moment of inertia (e) all of the above

ANSWERS

56	57	58	59	60	61	62	63	64	65
c	e	e	a	e	c	a	c	a	d
66	67	68	69	70	71	72	73	74	75
a	b	a	d	d	a	b	b	c	b

PART-B

(2 MARKS)

76. What are the types of loading acting on the structure?

There are three types of loading acting on the body. They are:

- (i) Body force (/f).
- (ii) Traction force (T).
- (iii) Point load (p).

77. Define body force (f). (AU MAY 2013)

A body force is distributed force acting on every elemental volume of the body. Unit:

Force per unit volume.

Example: Self-weight due to gravity.

78. Define Traction force (T).

Traction force is defined as distributed force acting on the surface of the body.

Unit: Force per unit area.

Examples: Frictional resistance, viscous drag, surface shear etc.

79. What is Point Load (P).

Point load is force acting at a particular point which causes displacement.

80. What are the basic steps involved in the finite element modeling.

Finite element modeling consists of the following:

- (i) Discretization of structure.
- (ii) Numbering of nodes.

81. What is discretization?

The art of subdividing a structure into a convenient number of smaller components is known as discretization.

82. What are the classifications of co-ordinates?

The co-ordinates are generally classified as follows:

- (i) Global co-ordinates.
- (ii) Local co-ordinates
- (iii) Natural co-ordinates.

83. What is Global co-ordinates?

The points in the entire structure are defined using co “ordinate system is known as global coordinate system.

84. What is natural co-ordinates?

A natural co-ordinate system is used to define any point inside the element by a set of dimensionless numbers, whose magnitude never exceeds unity. This system is very useful in assembling of stiffness matrices

85. Define shape function. (AU MAY 2008)

In finite element method, field variables within an element are generally expressed by the following approximate relation:

$$\Phi(x, y) = N_1(x, y) \phi_1 + N_2(x, y) \phi_2 + N_3(x, y) \phi_3$$

N_1, N_2, N_3 are also called shape functions because they are used to express the geometry or shape of the element.

ϕ_1, ϕ_2 & ϕ_3 are the values of the field variable at the nodes and N_1, N_2, N_3 are the interpolation functions

86. If a displacement field in x direction is given by $u: 2x^2 + 4y^2 + 6xy$. Determine the Strain in x direction.

$$U: 2x^2 + 4y^2 + 6xy$$

$$\text{Strain, } e = \frac{\partial u}{\partial x} = 4x + 6y$$

87. What is axisymmetric element?

Many three dimensional problems in engineering exhibit symmetric about an axis rotations. Such types of problems are solved by special two dimensional elements the axisymmetric element.

88. What are the conditions for a problem to be an axisymmetric?

The problem domain must be symmetric about axis of revolution,

All boundary conditions must be symmetric about axis of revolution. All loading conditions must be symmetric about axis of revolution.

89. What are the ways in which a three dimensional problem can be reduced to a two dimensional approach.

Plane stress: one dimensional is too small when compared to other two dimensions.

Example: Gear thickness is small.

Plane strain: one dimensional is too large when compared to other two dimensions.

Example: long pipe [length is long compared to diameter] **Axisymmetric:** geometry is symmetry about the axis.

Example: Cooling tower.

90. What is the purpose of isoperimetric elements? (AU DEC 2007)

It is difficult to represent the curved boundaries by straight edge finite elements. A large number of finite elements may be used to obtain reasonable resemblance between original body and the assemblage. In order to overcome this drawback, isoparametric elements are used. i.e., for problem involving curved boundaries, a family to elements is known as “isoparametric elements are used.

91. State the properties of stiffness matrix.

1. It is symmetric matrix.
2. The sum of elements in any column must equal to zero.
3. it is an unstable element. So, the determinant is equal to zero.

92. Write the general finite element equation.

$$\{F\} = [K] \{u\}$$

Where, $\{F\} \rightarrow$ Force vector [Column matrix]

$[K] \rightarrow$ Stiffness matrix [Row matrix]

$\{u\} \rightarrow$ Degrees of freedom [Column matrix]

93. State the assumptions are made while finding the forces in a truss.

1. All members are pin jointed
2. The truss is loaded only at the joints.
3. The self weight of the members is neglected unless stated.

94. Define potential energy. (AU MAY 2008)

The total potential energy π of an elastic body is defined as the sum of total strain energy U and the potential energy of the external forces, (W) .

Total potential energy, $\pi =$ strain energy $(U) + \{$ potential energy of the external forces $(W)\}$.

95. State the principle of minimum potential energy. (AU DEC 2009)

The principle of minimum potential energy states: among all the displacement equation that satisfy internal compatibility and the boundary conditions, those that also satisfy the equation of make the potential energy a minimum in a stable system.

96. State the principle of virtual work.

A body is in equilibrium if the internal virtual work equals the external virtual work for every kinematic ally admissible displacement field.

97. What are the difference between boundary value problem and initial value problem? (AU DEC, MAY 2010)

The solution of differential equation is obtained for physical problems which satisfies some specified condition known as boundary conditions.

The differential equation together with these boundary conditions, subjected to a boundary value problem.

The differential equation together with initial conditions subjected to an initial value problem.

PART C

[16 MARKS]

98. Derive shape function for the one dimensional bar element using global co-ordinates.

99. Derive the finite element equation for one dimensional problem.

100. Derive the stiffness matrix for one dimensional bar element.

101. Derive the force vector due to temperature effect.

102. A steel bar of length 800mm is subjected to an axial load of 3 kN as shown in fig. Find the elongation of the bar, neglecting self weight. Take $E = 2 \times 10^5 \text{ N/mm}^2$, $A = 300\text{mm}^2$.

103. Consider a bar shown in shown fig. An axial load of 200kN is applied at point p. Take $A_1=2400 \text{ mm}^2$, $E_1=70 \times 10^9 \text{ N/m}^2$, $A_2=600 \text{ mm}^2$, $E_2=200 \times 10^9 \text{ N/m}^2$. Calculate the following:
(a) The nodal displacement as point p. (b) Stress in each material. (c) Reaction force.

104. For a tapered plate of uniform thickness $t=10\text{mm}$ as shown in fig. Find the displacements at the nodes by forming into two element model. The bar has mass density $\rho = 7800\text{kg/m}^3$, young's modulus, $E=2 \times 10^5 \text{ MN/m}^2$. In addition to self-weight, the plate is subjected to a point load $p=10\text{kN}$ at its centre. Also determine the reaction force at the support.

105. A rod subjected to an axial load $P=600\text{kN}$ is applied as shown in fig. Divide the domain into two elements. Determine the following. (a) Displacement at each node. (b) Stresses in each element. (c) Reactions at each node point. Take $E=2 \times 10^5 \text{ N/mm}^2$, $A=2500\text{mm}^2$.

106. The structure shown in fig. is subjected to an increase in temperature of 80°C . Determine the displacements, stresses and support reactions. Assume the following data:

107. A spring assemblage with arbitrarily numbered nodes are shown in fig. The nodes 1 and 2 are fixed and a force of 500kN is applied at node 4 in the x-direction. Calculate the following:

(i) Global stiffness matrix. (ii) Nodal displacements. (iii) Reactions at each nodal points.

Take Spring constant, $k_1=100\text{kN/m}$; $k_2=200\text{kN/m}$; $k_3=300\text{kN/m}$.

108. Derive stiffness matrix for one dimensional truss element.

109. For the two bar truss shown in fig. Determine the displacements of nod 1 and the stress in element 1-3.

110. Consider a four bar truss as shown in figure. It is given that $E = 200000 \text{ N/mm}^2$ and $A_e = 625 \text{ mm}^2$ for all elements. Determine element stiffness matrix for each element, assemble the structural stiffness matrix K for the entire truss and displacements at all nodes.

111. For the plane truss shown in fig. determine the horizontal and vertical displacements of nodal and the stresses in each element. All elements have $E=201\text{GPa}$ and $A=4\times 10^{-4}$.

112. A fixed beam of length $2L$ m carries a uniformly distributed load of $w(\text{N/m})$ which run over a length of L m from the fixed end, as shown in fig. Calculate the rotation at point B.

113. For the beam and loading shown in fig. Calculate the rotations at B and C.
 $E=210\text{GPa}$, $I=6\times 10^6\text{mm}^4$.

UNIT III

TWO DIMENSIONAL FINITE ELEMENT ANALYSIS

PART- A

(1 MARK)

114. Maximum deflection in a cantilever beam of length l carrying a load P at its end will be

- (a) $\frac{Pl^3}{3EI}$ (b) $\frac{Pl^3}{8EI}$ (c) $\frac{Pl^3}{32EI}$ (d) $\frac{Pl^3}{64EI}$ (e) $\frac{Pl^3}{128EI}$

115. Maximum slope in case of cantilever beam of length l carrying a load P at its end will be

- (a) $\frac{Pl^2}{EI}$ (b) $\frac{Pl^2}{2EI}$ (c) $\frac{Pl^2}{3EI}$ (d) $\frac{Pl^2}{4EI}$ (e) $\frac{Pl^2}{6EI}$

116. Ties are load carrying members which carry

- (a) torsional loads (b) axial compressive loads (c) axial tension loads (d) transverse load (e) vertical compression loads

117. Sum of normal stress on any two mutually perpendicular planes as compared to sum of stress s_x and s_y is

- (a) some (b) more (c) less (d) depends on other condition (e) could be anything

118. When a beam is subjected to a transverse shearing force, the shear stress upper fiber will be

- (a) Maximum (b) minimum (c) zero (d) depends on other data (e) none of the above

119. A continuous beam is one which is

- (a) Infinitely long (b) supported at two places (c) supported at one point (d) Supported at more than two supported (e) none of the above

120. The ratio of hoop stress to longitudinal stress in thin walled cylinder is

- (a) 1 (b) 1/2 (c) 2 (d) 1/4 (e) 4

121. Rankine's constant for a M.S. column both ends hinged

- (a) $\frac{1}{1500}$ (b) $\frac{1}{3500}$ (c) $\frac{1}{5500}$ (d) $\frac{1}{7500}$ (e) $\frac{1}{9500}$

122. As the slenderness ratio of column increases, its compressive strength

- (a) increases (b) decreases (c) remain unchanged (d) may increase or decrease depending on length (e) un predictable

123. Euler's formula applicable for determining the buckling load for

- (a) long columns (b) intermediate column (c) medium size column
 (d) intermediate columns but with certain amendments it can be used both for short as well as long column (e) shorts columns

124. A long column fails by

- (a) crushing (b) tension (c) shearing (d) buckling (e) buckling and crushing

125. for eccentrically loaded strut, following section preferred

- (a) Solid (b) hollow (c) reinforced (d) composite (e) any one of the above

126. A column with maximum equivalent length has

- (a) Both end fixed (b) both ends hinged (c) one end fixed other hinged
 (d) one end fixed other free (e) both ends free

127. A column has its equivalent length equal to its length in case of

- (a) both end fixed (b) both ends hinged (c) one end fixed other hinged
 (d) one end fixed other free (e) both ends free

128. Deflection in a beam is maximum where the slop is

- (a) Maximum (b) minimum (c) zero (d) change in sign (e) any value

129. The distribution of stress in a beam of rectangular crass section will be

- (a) Triangular (b) rectangular (c) parabolic (d) elliptical (e) part of a circle

130. In a beam at a place where the shear force is maximum, the bending moment will be

- (a) Maximum (b) minimum (c) zero (d) neither minimum nor maximum (e) none of the above

131. Elasticity of M.S specimen is defined by

- (a) hooks low (b) yield point (c) when plastic flow starts (d) proof stress
 (e) permanent section

132. A coil is cut in to two halves, the stiffness of cut coils will be

- (a) Double (b) half (c) same (d) something else (e) none of the above

133. The ratio of longitudinal stress to shear stress in thin walled cylinder

- (a) 1 (b) 1/2 (c) 2 (d) 1/4 (e) 4

ANSWERS

114	115	116	117	118	119	120	121	122	123
a	b	c	a	c	d	c	d	b	a
124	125	126	127	128	129	130	131	132	133
a	d	d	b	c	c	a	a	a	d

PART B**[2 MARKS]****134. Name any four FEA software.**

1. ANSYS.
2. NASTRAN.
3. COSMOS.
4. NISA.

135. Difference between global and local axes.

Local axes are established in an element. Since it is in the element level, they change with the change in orientation of the element. The direction differs from element to element. Global axes are defined for the entire system. They are same in direction for all the elements even though the elements are differently oriented

136. State the methods of engineering analysis. (AU MAY 2007)

There are three methods of engineering analysis they are:

Experimental method Analytical methods.

Numerical methods or approximate methods.

137. What is meant by finite element?

A small unit having definite shape of geometry and nodes is called finite element.

138. What is meant by finite element analysis? (AU MAY 2010)

Finite element method is a numerical method for solving problem of engineering and mathematics. In the finite element method instead of solving the problem for the entire body in one operation we formulate the equation for each finite element and combine them to obtain the solution of the whole body.

139. Explain force method and stiffness method? (AU DEC 2008)

In force method internal force are considered as the unknown of the problem. In displacement or stiffness method, displacement of the nodes is considered method as the unknown of the problem. Among them two approaches, displacement method is desirable.

140. Why polynomial types of interpolation function are mostly used in FEM?

The polynomial types of interpolation function are mostly used due to the following reasons: It is easy to formulate and computerize the finite element equations.

It is easy to perform differentiation or integration.

The accuracy of the result can be improved by increasing the order of the polynomial.

141. Name the variational methods.

1. Ritz-method.
2. Rayleigh-Ritz method.

142. What is meant by plane stress analysis? (AU MAY 2010)

Plane stress is defined to be a state of stress in which the normal stress (σ) and shear stress (τ) directed perpendicular to the plane are assumed to be zero.

143. Define plane strain analysis.

Plane strain is defined to be a state of strain in which the strain normal to the xy plane and the shear strain are assumed to be zero.

144. What is axisymmetric element?

Many three dimensional problems in engineering exhibit symmetry about an axis of rotation. Such types of problems are solved by a special two dimensional element called as axisymmetric element.

145. What are the conditions for a problem to be axisymmetric?

- i. The problem domain must be symmetric about the axis of revolution.
- ii. All boundary conditions must be symmetric about the axis of revolution.
- iii. All loading conditions must be symmetric about the axis of revolution.

146. Write down the displacement equation for an axisymmetric triangular element. (AU MAY 2007)

147. Write down the shape function for an axisymmetric triangular element.

148. Give the strain displacement matrix equation for an axisymmetric triangular element. (AU MAY 2009)

149. Write the stress-strain relationship matrix equation for an axisymmetric triangular element. (AU DEC 2010)

150. Give the stiffness matrix equation for an axisymmetric triangular element.

151. Calculate the jacobian of the transformation J for the triangular element shown in figure. (AU MAY 2010)

152. What is purpose of Isoparametric elements?

It is difficult to represent the curved boundaries by straight edges finite elements. A large number of finite elements may be used to obtain reasonable resemblance between original body and the assemblage. In order to overcome this drawback, isoparametric elements are used i.e., for problems involving curved boundaries, a family of elements known as “isoparametric elements” are used

153. Write down the shape function for 4 noded rectangular element using natural coordinates system. (AU MAY 2008)

154. Write down the Jacobian matrix for 4 noded quadrilateral elements.

155. Write down the stiffness matrix equation 4 noded isoparametric quadrilateral element.

156. Write down the element force vector equation for 4 noded quadrilateral elements. (AU MAY 2009)

157. Write down the Gaussian quadrature expression for numerical integration.

158. Define super parametric element.

If the number of nodes used for defining the geometry is more than number of nodes used for defining the displacements, then, it is known as superparametric element.

159. What is meant by subparametric element?

If the number of nodes used for defining the geometry is less than number of nodes used for defining the displacements, then, it is known

160. What is the difference between natural co-ordinate and simple co-ordinate? (AU DEC 2010)

161. Is beam element an isoparametric element?

Beam Element is not an isoperimetric element since the geometry and displacement are defined by different order interpolation functions.

162. What is meant by isoparametric element?

If the number of nodes used for defining the geometry is same as number of nodes used for defining the displacements, then, it is known as isoperimetric element

163. Give examples for essential (forced or geometric) and non-essential boundary conditions. (AU DEC 2010)

The geometric boundary conditions are displacement, slope, etc. the natural boundary conditions are bending moment, shear force, etc.

164. What are the types of non-linearity? (AU MAY 2010)

- i. Non – linearity in material behavior from point to point.
- ii. Non – linearity in loading- deformation relation.
- iii. Geometric Non – linearity
- iv. Change in boundary condition for different loading.

PART C**[16 MARKS]****165. Derive the shape function for constant strain triangular element (CST).****166. Derive the strain-displacement matrix for constant strain triangular element (CST). (AUDEC 2007)****167. Derive stress-strain relationship matrix or constitutive matrix for two dimensional elements.****168. Determine the stiffness matrix for the CST element shown in figure. The co-ordinates are given in units of millimeters. Assume plane stress conditions. Take $E = 210 \text{ GPa}$, $\nu = 0.25$ and $t = 10\text{mm}$. (AU MAY 2007)****169. Calculate the stiffness matrix for the shown in figure. The co-ordinates are given in millimeters. Assume plane stress conditions. Take $E = 210000 \text{ N/mm}^2$, $\nu = 0.25$ and $t = 10\text{mm}$.****170. Evaluate the element stiffness matrix for the triangular element shown in figure.1 under plane stress conditions. Take $E = 200000 \text{ N/mm}^2$, $\nu = 0.3$ and $t = 10\text{mm}$. (AU DEC 2010)**

171. For the plane stress element shown in figure. The nodal displacement are $u_1 = 2\text{mm}$, $u_2 = 0.5\text{mm}$, $u_3 = 3\text{mm}$ and $v_1 = 1\text{mm}$, $v_2 = 0$, $v_3 = 1\text{mm}$. Determine the element stress σ_x , σ_y , τ_{xy} σ_1 and σ_2 and the principle angle θ_p . Let $E = 210\text{ GPa}$, $\nu = 0.25$ and $t = 10\text{mm}$. All co-ordinates are in millimeters.

172. Calculate the element stress σ_x , σ_y , τ_{xy} σ_1 and σ_2 and the principle angle θ_p for the element shown in figure. The nodal displacement are $u_1 = 2\text{mm}$, $u_2 = 0.5\text{mm}$, $u_3 = 3\text{mm}$ and $v_1 = 1\text{mm}$, $v_2 = 0$, $v_3 = 1\text{mm}$. Let $E = 210\text{ GPa}$, $\nu = 0.25$. Assume plane stress condition. (AU MAY 2009)

173. For the plane strain element shown in figure. The nodal displacement are $u_1 = 0.005\text{mm}$, $u_2 = 0\text{mm}$, $u_3 = 0.005\text{mm}$ and $v_1 = 0.002\text{mm}$, $v_2 = 0$, $v_3 = 0\text{mm}$. Determine the element stress σ_x , σ_y , τ_{xy} σ_1 and σ_2 and the principle angle θ_p . Let $E = 70\text{ GPa}$, $\nu = 0.3$ and use unit thickness for plane strain. All co-ordinates are in millimeters. (AU MAY 2010)

174. For the triangular element shown in figure. Obtain the strain displacement relation matrix $[B]$ and determine the strains e_x , e_y and γ_{xy} . The nodal displacement are $u_1 = 0.001\text{mm}$, $u_2 = 0.003\text{mm}$, $u_3 = -0.003\text{mm}$ and $v_1 = -0.004\text{mm}$, $v_2 = 0.002$, $v_3 = 0.005\text{mm}$. All co-ordinates are in millimeters.

175. Derive shape function for axisymmetric element.

176. Derive stress-strain relationship matrix for axisymmetric element.

177. For axisymmetric elements shown in fig, determine stiffness matrix.

Let $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $\nu = 0.25$. The co-ordinates all are in millimeters.

178. For the axisymmetric elements shown in figure [1], determine the element stresses.

Let $E = 210 \text{ GPa}$ and $\nu = 0.25$. The co-ordinates all are in millimeters. The nodal displacement are $u_1 = 0.05 \text{ mm}$, $u_2 = 0.02 \text{ mm}$, $u_3 = 0 \text{ mm}$ and $w_1 = 0.03 \text{ mm}$, $w_2 = 0.02$, $w_3 = 0 \text{ mm}$. (AU MAY 2009)

179. For the axisymmetric elements shown in figure [1], determine the element stresses. Let $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $\nu = 0.25$. The co-ordinates all are in millimeters. The nodal displacement are $u_1 = 0.05 \text{ mm}$, $u_2 = 0.02 \text{ mm}$, $u_3 = 0 \text{ mm}$ and $w_1 = 0.03 \text{ mm}$, $w_2 = 0.02$, $w_3 = 0 \text{ mm}$.

180. Calculate the element stiffness matrix and the thermal force vector for the axisymmetric triangular element shown in figure. The element experiences a 15°C increase in temperature. The co-ordinates are in millimeters. Take $\alpha = 10 \times 10^{-6} / ^\circ \text{C}$; $E = 2 \times 10^5 \text{ N/mm}^2$; $\nu = 0.25$. (AU MAY 2010)

181. Calculate the element stresses for the axisymmetric element shown in figure. The nodal displacement are $u_1 = 0.06 \text{ mm}$, $u_2 = 0.02 \text{ mm}$, $u_3 = 0.01 \text{ mm}$ and $w_1 = 0.04 \text{ mm}$, $w_2 = 0.03$, $w_3 = 0.01 \text{ mm}$. (AU DEC 2008)

182. The integral $f(r) = (r^3 + 2r^2 + 1)$ between the limits -1 and +1 can be evaluated exactly by using two point Gaussian. (AU MAY 2009)
183. Integrate the function $f(r) = 1 + r + r^2 + r^3$ between the limits -1 and +1 using (a) Exact method, (b). Gauss integration and compare the two results.
184. The integral $f(x) = \cos x / (1-x^2)$ dx between the limits -1 and +1 by using 3 point Gaussian quadrature. (AU MAY 2010)
185. Evaluate the integral $f(x) = \cos (\pi x / 2)$ dx between the limits of -1 and +1 by using three point Gaussian quadrature and compare with exact solution.
186. Evaluate the integral $f(x) = \cos (x / 2)$ dx between the limits of -1 and +1 by using three point Gaussian quadrature and compare with exact solution.
187. Evaluate the integral $f(x) = (2+x+x^2)$ dx between the limits of -1 and +1 by using three point Gaussian quadrature and compare with exact solution.
188. For the isoperimetric four noded quadrilateral elements shown in figure. Determine the Cartesian co-ordinates of point P which has local co-ordinates $\epsilon = 0.5$ and $\eta = 0.5$. (AU MAY 2009)
189. For the isoperimetric four noded quadrilateral elements shown in figure. Determine the local co-ordinates of point P which has Cartesian co-ordinates (7, 4). (AU DEC 2007)
190. Evaluate [J] at $\epsilon = \eta = 0.25$ for the linear quadrilateral element shown in figure. (DEC 10)

UNIT IV

DYNAMIC ANALYSIS USING FINITE ELEMENT METHOD

PART A

[1 MARK]

191. Any motion which repeats itself after an interval of time is called

- (a) Vibration (b) Frequency (c) Damping (d) Resonance

192. The unit of young's modulus

- (a) mm/mm (b) kg/cm (c) kg (d) kg/cm² (e) kgcm²

193. Deformation per unit length in the direction of force is known as

- (a) Strain (b) Lateral strain (c) Linear strain (d) Linear stress (e) Unit strain

194. When the particles of the shaft or disc moves parallel to the axis of the shaft, then the vibration are known as

- (a) longitudinal vibration (b) damped vibration (c) transverse vibration (d) undamped vibration

195. The frequency of the free vibration is called

- (a) forced vibration (b) natural frequency (c) damped vibration (d) undamped vibration

196. Percentage reduction of area in performing tensile test on cast iron may be of the order of

- (a) 50% (b) 25% (c) 0% (d) 15% (e) 60%

197. The intensity of stress which causes unit strain is called

- (a) Unit stress
(b) Bulk modulus (c) Modulus of rigidity (d) Modulus of elasticity
(e) Principal stress

198. For steel, the ultimate strength in shear as compared in to tension

- (a) Same (b) Half (c) one-third (d) two-third (e) one-fourth

199. Which of the following has no limit?

- (a) Kinematic viscosity (b) Surface tension (c) Bulk modulus (d) Strain
(e) Elasticity

200. The main causes of vibration

- (a) Radiation (b) magnification factor (c) Unbalanced forces (d) Potential energy

201. The value of modulus of elasticity for mild steel is of the order of

- (a) 2.1×10^5 kg/mm² (b) 2.1×10^6 kg/mm² (c) 2.1×10^7 kg/mm² (d) 0.1×10^5 kg/cm²
(e) 3.8×10^5 kg/cm²

202. The value of poisson ratio for steel is between

- (a) 0.01 to 0.1 (b) 0.23 to 0.27 (c) 0.25 to 0.33 (d) 0.4 to 0.6 (e) 3 to 4

203. For which the material the passion's ratio is more than unity

- (a) steel (b) copper (c) Aluminum (d) Cast iron (e) none of the above

204. The change in unit volume of a material under tension with increase in its passion's ratio's will ____ (a) Increase (b) Decrease (c) remain same (d) increase initially and then decrease (e) none of the above

205. If the material heating it expands freely due to will develop

- (a) Thermal stress (b) tensile stress (c) bending (d) Compressive stress (e) No stress

206. Flow stress corresponds to

- (a) Fluids in motion (b) breaking point (c) plastic deformation of solids (d) rupture stress
(e) none of the above

207. The total strain energy stored in a body is termed as

- (a) Resilience (b) Proof resilience (c) Modulus of resilience (d) Toughness
(e) Impact energy

208. A beam is loaded as cantilever. If the load at end is increased, the failure will occur

- (a) in the middle (b) at the tip below the load (c) at the support (d) anywhere (e) none of the above

209. Rivets are made of following type of material

(a) tough (b) hard (c) resilient (d) ductile (e) malleable

210. A beam of length l, having uniform load of w kg per unit length, it supported freely at the ends .the bending moment at mid span will be

(a) $\frac{wl^2}{4}$ (b) $\frac{wl^2}{2}$ (c) $\frac{wl^2}{4}$ (d) $\frac{wl^2}{8}$

ANSWERS

191	192	193	194	195	196	197	198	199	200
a	d	c	a	b	c	d	b	d	c
201	202	203	204	205	206	207	208	209	210
b	c	e	b	e	c	a	c	d	d

PART B

[2 MARKS]

211. Define frequency of vibration.

It is the number of cycles described in one second. Unit is Hz.

212. Define Damping ratio.

It is defined as the ratio of actual damping coefficient (C) to the critical damping coefficient (Cc).

$$\text{Damping ration } \varepsilon = C / C_c = C / 2m\omega_n$$

213. What is meant by longitudinal vibrations?

When the particles of the shaft or disc moves parallel to the axis of the shaft, then the vibrations are known as longitudinal vibrations.

214. What is meant by transverse vibrations?

When the particles of the shaft or disc move approximately perpendicular to the axis of the shaft, then the vibrations are known as transverse vibrations.

215. Define magnification factor.

The ratio of the maximum displacement of the forced vibration (x_{\max}) to the static deflection under the static force (X_0) is known as magnification factor.

216. Write down the expression of longitudinal vibration of bar element.

Free vibration equation for axial vibration of bar element is,

$$[K] \{u\} = \omega^2 [m] \{u\}$$

Where, u – displacement

[K] – stiffness matrix

ω – Natural frequency

[m] – Mass Matrix

217. Write down the expression of governing equation for free axial vibration of rod.

The governing equation for free axial vibration of a rod is given by,

Where, E – young's modulus,

A – Cross-sectional area

ρ - Density

218. Write down the expression of governing equation for transverse vibration of beam.

The governing equation for free transverse vibration of a beam is,

Where, E – young's modulus
 I – moment of inertia
 A – Cross-sectional area
 ρ – Density

219. Write down the expression of transverse vibration of beam element.

Free vibration equation for transverse vibration of beam element is,
 $[K] \{u\} = \omega^2 [m] \{u\}$

Where, $[K]$ = stiffness matrix for beam element

220. What are the types of Eigen value problems?

There are essentially three groups of method of solution,

1. Determinant based methods.
2. Transformation based methods.
3. Vector iteration methods.

221. State the principle of superposition.

It states that for linear systems, the individual responses to several disturbances or driving functions can be superposed on each other to obtain the total response of the system.

222. Define resonance.

When the frequency of external force is equal to the natural frequency of a vibrating body, the amplitude of vibration becomes excessively large. This phenomenon is known as resonance.

223. Define Dynamic Analysis.

When the inertia effect due to the mass of the components is also considered in addition to the externally applied load, then the analysis is called dynamic analysis.

224. What are the methods used for solving transient vibration problems?

There are two methods for solving transient vibration problems. They are:

- a) Mode superposition method
- b) Direct integration method

225. Write down the equation for undamped system of Direct Integration Method in Central Difference Method.

For an undamped system,

226. State the two difference between direct and iterative methods for solving system of equations.

Direct Method

- i) It gives exact value.
- ii) Simple, take less time.
- iii) Determine all the roots at the same time.

Iterative Method

- i) It gives only approximate solution.
- ii) Time consuming and labourious.
- iii) Determine only one root at the time.

227. Define linear dependence and independence of vectors.

Linear dependence : The vectors X_1, X_2, \dots, X_n are said to be linearly dependent if there exist scalars $\lambda_1, \lambda_2, \dots, \lambda_n$ (not all zero) such that,

$$\lambda_1 X_1 + \lambda_2 X_2 + \dots + \lambda_n X_n = 0$$

Independence: The vectors X_1, X_2, \dots, X_n are said to be linearly independent if,

$\lambda_1 X_1 + \lambda_2 X_2 + \dots + \lambda_n X_n$ is equal to zero such that

$$\lambda_1 = 0, \lambda_2 = \dots = \lambda_n = 0$$

228. Show that the matrix, $A =$ is orthogonal.

Solution:

229. Prove that the vectors (1,4,-2), (-2,1,3) and (-4,11,5) are linearly dependent.

Solution:

Since , $/A/ = 0$, the given vectors are linearly dependent.

PART C**[16 MARKS]**

230. Find the natural frequency of longitudinal vibration of the unconstrained stepped bar as shown in fig. (AU, M.E., Nov.2006)

231. For the bar as shown in fig. with length $2L$, modulus of elasticity E , mass density ρ , and cross sectional area A , determine the first two natural frequencies.

232. Consider a uniform cross-section bar as shown in fig. of length “ L ” made up of a material whose young’s modulus and density are given by E and ρ . Estimate the natural frequencies of axial vibration of the bar using both lumped and consistent mass matrix. (AU May 2005)

233. For the one-dimensional bar shown in fig. determine the natural frequencies of longitudinal vibration using two elements of equal length. Take $E = 2 \times 10^5 \text{ N/mm}^2$, $\rho = 0.8 \times 10^{-4} \text{ N/mm}^3$, and $L=400\text{mm}$.

234. Determine the natural frequency of vibration for a beam fixed at both ends as shown in fig. The beam has mass density ρ , modulus of elasticity E , cross-sectional area A , moment of inertia I , and length $2L$. For simplicity of the long hand calculations, the beam is discretized into two elements of length L .

235. Consider the simply supported beam shown in fig. Let the length $L=1\text{m}$, $E=2 \times 10^{11}\text{N/m}^2$, area of cross-section, $A=30\text{cm}^2$, Moment of inertia $I=100\text{mm}^4$, density $\rho=7800\text{kg/m}^3$. Determine the natural frequency using the two types of mass matrix i.e., lumped mass matrix and consistent mass matrix.

236. Determine the natural frequencies for the 3degrees of freedom system shown in fig.

237. Find the eigen values and eigen vectors of

238. Determine the eigen values and frequencies for the stepped bar as shown in fig. take $E=2 \times 10^5\text{N/mm}^2$, unit weight density $\rho=0.8 \times 10^{-4}\text{N/mm}^3$

239. Determine the eigen values and natural frequencies of a system whose stiffness and mass matrices are given below. (AU Jun 2008)

240. Assembled stiffness matrix and mass matrix are given by,

Find the eigen pairs and natural frequencies of this system using the simultaneous method.

241. Consider the undamped 2 degree of freedom system as shown in fig. Find the response of the system when the first mass alone is given an initial displacement of unity and released from rest.

The mathematical representation of the system for free, harmonic vibration is given by,

UNIT V APPLICATIONS IN HEAT TRANSFER & FLUID MECHANICS

PART A

[1 MARK]

242. Heat transfer takes place by the process of

- a. Conduction b. convection c. radiation d. all of the above

243. The rate of heat transfer is constant if

- b. Temperature decrease with time b. Temperature increase with time
c. Temperature is constant with time d. none of the above

244. If the rate of heat transfer is constant, it is known as

- a. Steady state heat transfer b. unsteady state heat transfer
c. Uniform heat transfer d. non- uniform heat transfer

245. The process of heat transfer ,from one particle of the to another by the actual motion of heated particles is called

- b. radiation b. convection
d. conduction d. none of the above
- 246. heat energy can be obtained from other type of energy is the statement of**
a. first law of thermodynamics b. second law of thermodynamics
c. zeroth law of thermodynamics d. fourier's law
- 247. The basic law of heat conduction is called**
a. newton's law of cooling b. stefan's law c. Kirchoff's law d. fourier's law
- 248. The thermal conductivity in SI units is expressed as**
a. $\text{j/m}^2\text{k}$ b. $\text{w/m}^{\circ}\text{k}$ c. $\text{w/m}^{\circ}\text{k sec}$ d. $\text{wm}/^{\circ}\text{k}$
- 249. The term Q/A (in heat flow equation $Q=KA(t_1-t_2)/\Delta x$) is known as**
a. Thermal resistance b thermal conductance c. thermal loading d. none of the above
- 250. For steady flow and constant value of conductivity, the temperature distribution for a plane wall is**
a. Parabolic b linear c. logarithmic function of radii d. cubic.
- 251. The rate of heat transfer through hollow cylinder of radii r1 and r2 depends on**
a. difference of radii (r_1-r_2) b the radio radii (r_1/r_2) c. product of (r_2*r_1)
d. sum of radii (r_1+r_2)
- 252. The critical radius of insulation for a hollow cylinder is equal to**
a. difference of radii (r_1-r_2) b the radio radii (r_1/r_2) c. product of (r_2*r_1) d. sum of radii (r_1+r_2)
- 253. In case of heat exchanger, the value of logarithmic mean temperature difference should**
a. As small as possible b. as large as possible c. constant d. none of the above
- 254. Choose the correct statement.**
a. Fourier's law of heat conduction gives the heat flow for
b. Thermal conductivity of air increase with decrease in temperature.
c. thermal conductivity of solids increase with rise in temperature
d. the unit of thermal conductivity in SI units is $\text{W/m}^{\circ}\text{K}$
- 255. If h= co-efficient of heat transfer, K= thermal conductivity and l is characteristics linear dimensions then the thermal hl/K is called.**
a. Reynolds number b. Nussle number c. prenatal number d. Froude number
- 256. If μ = co-efficient of viscosity, c_p = specific heat at constant pressure and k is thermal conductivity then the term $\mu c_p/k$ is called**
a. Reynolds number b. nusselt number c. prandtl number d. froude number
- 257. In free convection, motion of the fluid is caused**
a. By the weight of the fluid element b. By the hydrostatic force on the element c. by the buoyancy forces arising from variation in density of the fluid with the temperature d. none of the above.
- 258. If μ = co-efficient of viscosity, c_p = specific heat at constant pressure and k is thermal conductivity then the term $\mu c_p/k$ is called**
a. Reynolds number b. nusselt number c. prandtl number d. froude number
- 259. The process which transmits energy by means of electromagnetic waves is called**
a. Conduction b. convection c. radiation d. all of the above
- 260. The process which transmits energy by means of electromagnetic waves is called**
b. Conduction b. convection c. radiation d. all of the above
- 261. The amount of radiation depends upon**
a. temperature of the body only b. surface area of the body only c. nature of the body
d. all of the above

ANSWERS

242	243	244	245	246	247	248	249	250	251
d	c	a	b	b	b	b	c	B	b
252	253	254	255	256	257	258	259	260	261
a	b	d	b	c	c	c	c	b	b

PART B**[2 MARKS]****262. Define Heat transfer.**

Heat transfer can be defined as the transmission of energy from one region to another region due to temperature difference.

263. Write down the stiffness matrix equation for one dimensional heat conduction element.

Stiffness matrix, $[K] =$

Where,

$A =$ area of the element, m^2

$K =$ thermal conductivity, W/mK

$l =$ length of the element, m

264. Write down the expression of shape function, N and temperature function, T for one dimensional heat conduction element.

For one dimensional heat conduction element,

$$\text{Temperature function, } T = N_1T_1 + N_2T_2$$

Where, $N_1 = N_2 =$

265. Writedown the finite element equation for one dimensional heat conduction with free end convection.

Finite element equation for one dimensional element heat conduction with free end convection is given by,

266. Write down the governing equation for two-dimensional heat conduction.

Governing equation for two-dimensional heat conduction,

267. Write down the shape function for two-dimensional heat transfer.

For two-dimensional heat transfer element,

$$T = N_1T_1 + N_2T_2 + N_3T_3$$

Where,

268. Write down the expression for stiffness matrix in two-dimensional heat conduction and convection.

Stiffness matrix for conduction,

269. Define path line.

A path line is defined as locus of points through which a fluid particle of fixed identity passes as it moves in space.

270. Define streamline.

A streamline is an imaginary line that connects a series of points in space at a given instant in such a manner that all particles falling on the line at that instant have velocities whose vectors are tangent to the line.

271. Define Inviscid flow.

A inviscid flow is a frictionless flow characterized by zero viscosity. A viscous flow is one in which the fluid is assumed to have non-zero viscosity.

272. Write down the expression for governing equation in fluid mechanics, 2-D.

The governing equation for a two-dimensional problem is given by,

273. Write down the expression of shape function for 2-D in fluid mechanics.

Shape function for 2-D fluid mechanics,

274. Write down the expression for stiffness matrix in 2D fluid mechanics.

Stiffness matrix for 2D in fluid mechanics,

275. Write down the expression for velocity gradient in fluid mechanics.

Velocity gradient in 2D fluid mechanics,

PART C

[16 MARKS]

276. A wall of 0.6m thickness having thermal conductivity of 1.2 W/mK. The wall is to be insulated with a material of thickness 0.06m having an average thermal conductivity of 0.3 W/mK. The inner surface temperature is 1000°C and outside of the insulation is exposed to atmospheric air at 30°C with heat transfer coefficient of 35 W/m²K. Calculate the nodal temperature.

277. A furnace wall is made up of three layers, inside layer with thermal conductivity 8.5 W/mK, the middle layer with conductivity 0.25 W/mK, the outer layer with conductivity 0.08 W/mK. The respective thickness of the inner, middle and outer layer are 25cm, 5cm and 3cm respectively. The inside temperature of the wall is 600°C and outside of the wall is exposed to atmospheric air at 30°C with heat transfer coefficient of 45 W/m²K. Determine the nodal temperatures.

278. An aluminium alloy fin of 7mm thick and 50mm long protrudes from a wall, which is maintained at 120°C. The ambient air temperature is 22°C. The heat transfer coefficient and thermal conductivity of the fin material are 140 W/m²K and 55 W/mK respectively. Determine the temperature distribution of fin.

279. A Steel rod of diameter $d = 2\text{cm}$, length $L = 5\text{ cm}$ and thermal conductivity $k = 50\text{ W/m}^\circ\text{C}$ is exposed at one end to a constant temperature of 320°C. The other end is in ambient air of temperature 20°C with a convection coefficient of $h = 100\text{ W/m}^2\text{C}$. Determine the temperature at the midpoint of the rod. (M.E., Engg. Design, AU, JAN-05)

280. Calculate the temperature distribution in a one dimension fin with physical properties given in fig. The fin is rectangular in shape and is 120 mm long, 40 mm wide and 10 mm thick. Assume that convection heat loss occurs from the end of the fin. Use two elements. Take $k = 0.3\text{ W/mm}^\circ\text{C}$; $h = 1 \times 10^{-3}\text{ W/mm}^2\text{C}$, $T_\infty = 20^\circ\text{C}$.

281. Find the temperature distribution in a square region with uniform energy generation as shown in fig. Assume that there is no temperature variation in z-direction. Take $k = 30$ W/cm°C, length = 10cm, $T_{\infty} = 50^{\circ}\text{C}$, $q = 100$ W/cm³. (M.E., CAD/CAM, AU, May'02)

282. Compute the element matrix and vectors for the element shown in fig. When the edge 2-3 and 3-1 experience convection heat loss. (M.E., CAD/CAM, AU, Jan'03)

283. For the two dimensional sandy soil region shown in fig. Determine the potential distribution and velocity gradient. The potential (fluid head) on the left side is a constant 10.0m, and that on the right side is 0.0m. The upper and lower edges are impermeable. The permeabilities are $k_x = k_y = 25 \times 10^{-5}$ m/s. Assume unit thickness. (M.E., Engg. Design, AU, May-06)

284. For the two dimensional fluid flow as shown in fig. Determine the potentials at the center and right edge. Take $k_x = k_y = 25 \times 10^{-5}$ m/s

285. A pump pumping fluid at $Q = 6500 \text{ m}^3/\text{hr}$ is located at coordinates (5,2) in the element as shown in fig. Find the amount of Q allotted to each node. All nodal coordinates are in m. Assume unit thickness of $t = 1 \text{ mm}$.

SUB CODE: ME2026

SUB NAME: UNCONVENTIONAL MACHINING PROCESSES

UNIT I INTRODUCTION

PART-A

1 MARK

1.Manufacturing processes can be broadly divided into ----- groups

a)four types b)three types c)two types. D)five types

2.Material removal processes can be divided into mainly ----- groups

a)four types b)three types c)two types. D)five types

3.Examples of conventional machining processes are

a) turning b) boring c) milling d) all of this

4.Examples of non conventional machining processes are

a) Abrasive Jet Machining (AJM) b) Electro-discharge Machining c) a & b . d) none of this

5.The major characteristics of conventional machining are

A) Generally macroscopic chip formation by shear deformation

B) Material removal takes place due to application of cutting forces – energy domain

C) Cutting tool is harder than work piece at room temperature as well as

D) above all

6.The major characteristics of Non Traditional Machining (NTM) Processes

A) Material removal may occur with chip formation or even no chip formation may take place

B) not be a physical tool present

C) the tool need not be harder than the work piece material

D) Above all

7.Mechanical Processes

A) Abrasive Jet Machining (AJM)

- B) Ultrasonic Machining (USM)
- C) Cutting and shaping
- D) Above A) and B

8. Electrochemical Processes

- A) Electrochemical Machining (ECM)
- B) Electro Chemical Grinding (ECG)
- C) Electro Jet Drilling (EJD)
- D) Above all

9. Electro-Thermal Processes

- A) Electro-discharge machining (EDM)
- B) – Laser Jet Machining (LJM)
- C) – Electron Beam Machining (EBM)
- D) Above all

10. Chemical Processes

- A) Chemical Milling (CHM)
- B) Photochemical Milling (PCM)
- C) AJM and WJM
- D) A) and B)

11. Electro chemical process is a -----process

- A) Non traditional process
- B) Traditional process
- C) Mechatronics involvement
- D) None of this

12. EDM is mainly used to machine the

- A) high strength temperature resistant alloys
- B) Low strength temperature alloys
- C) Low strength temperature resins
- D) High strength alloys.

13. The followings are the different electrode materials which are used commonly in the industry:

- A) Graphite
- B) electrolytic oxygen free copper
- C) tellurium copper-99% Cu + 0.5% tellurium
- D) Above all

14. AJM nozzles are made of

- A) low carbon steel
- B) HSS
- C) WC
- D) stainless steel

15. As the standoff distance increases, the depth of penetration in AJM

- A) increases
- B) decreases
- C) does not change
- D) initially increases and then remains steady.

16. AJM nozzles are made of

- A) low carbon steel
- B) HSS
- C) WC
- D) stainless steel

17. Material removal in AJM of glass is around

- A) $0.1\text{mm}^3/\text{min}$
- B) $15\text{mm}^3/\text{min}$
- C) $15\text{mm}^3/\text{sec}$
- D) $1500\text{mm}^3/\text{min}$

18. For producing micro holes the best process is

- A) EBM
- B) ECM
- C) LBM
- D) USM

19. Material removal takes place in AJM due to

- A) electro chemical reaction
- B) mechanical impact
- C) fatigue failure of the material
- D) sparking on impact

20. Mechanism of material removal in electron beam machining is due to

- A) Mechanical erosion due to impact of high energy electrons
- B) chemical etching by the high energy electron
- C) sputtering due to high energy electrons
- D) melting and vaporisation due to thermal effect of impingement of high energy electron.

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	a	d	c	c	b	b	b	d	b	b	a	a	a	d	c	c	c	c	c

PART-B**2 MARKS****21. What is meant by conventional machining processes? [AU, MAY-09]**

In conventional machining processes, metal is removed by using some sort of the tool which is harder than the work piece being in direct contact with each other.

22. what is meant by unconventional machining processes. [AU, MAY-12]

The unconventional machining processes do not employ a conventional or traditional tool for metal removal, instead, they directly utilize some form of energy for metal machining. In this process, there is no direct physical contact between the tool and the work piece.

23. what is thermal energy method of unconventional machining? [AU, Apr-13]

In these methods, heat energy is concentrated on a small area of the work piece to melt and vaporize the tiny bits of work material. The required shape is obtained by the continued repetition of this process. Example: LBM, PAM, EBM, IBM.

24. what is an electro chemical energy method of unconventional machining?

In these method, material is removed by ion displacement of the work piece material in contact with a chemical solution Example: ECM, ECG, ECH, ECD.

25. what is chemical energy method of unconventional machining?

The chemical energy method involves controlled etching of the work piece material in contact with a chemical solution. Example: CHM

26. what is mechanical energy method of unconventional machining?

In mechanical energy methods, the material is removed by mechanical erosion of the work piece material. Example: USM, AJM, WJM.

27. List the unconventional machining process which uses mechanical energy. [AU, MAY-09]

1. Ultrasonic machining.
2. Abrasive jet machining.
3. Water jet machining.

28. List the unconventional machining process, which uses thermal or heat energy. [AU, MAY-10]

1. Laser beam machining (LBM).
2. plasma arc machining (PAM).
3. Electron beam machining (EBM).
4. ion beam machining (IBM).

29. List the unconventional machining process, which uses electro chemical energy.

1. Electro chemical machining
2. electro chemical grinding.
3. electro chemical honing.
4. electro chemical deburring.

30. Name the unconventional machining processes which are used to remove maximum material.

1. Electro chemical machining.
2. plasma arc machining.

Part-C (16 mark questions)

31. Compare the mechanical and electrical energy process in terms of physical parameters, shape capabilities, process capabilities and process economy.

32. State the needs for unconventional machining process. [AU, MAY-09, MAY-10]

33. Compare conventional and unconventional machining processes. [AU, MAY-11, MAY-12]
 34. Explain the classification of unconventional machining processes. [AU, MAY-09, Apr-13]
 35. What do you understand by chip less machining and what harmful effect may such machining have? Explain. [AU, MAY-12]
 36. Make a comparison among various non-traditional machining processes in terms of the following. (1) Cavity-sinking (through) operation (2) pocketing operation (3) Through cutting operations. [AU, MAY-12]

UNIT-II MECHANICAL ENERGY BASED PROCESSES

PART-A

1 MARK

37. In Abrasive Jet Machining (AJM), abrasive particles are made to impinge on the work material at a

- a) High velocity..
- b) Medium velocity
- c) Low velocity
- d) 800-1200 kgf/cm

38 . AJM nozzles are made of

- (a) low carbon steel
- (b) HSS
- (c) WC..
- (d) Stainless steel

39. Material removal in AJM of glass is around

- (a) $0.1 \text{ mm}^3/\text{min}$
- (b) $15 \text{ mm}^3/\text{min}..$
- (c) $15 \text{ mm}^3/\text{s}$
- (d) $1500 \text{ mm}^3/\text{min}$

40. Material removal takes place in AJM due to

- (a) electrochemical action
- (b) mechanical impact..
- (c) fatigue failure of the material
- (d) sparking on impact

41. As the stand off distance increases, the depth of penetration in AJM

- (a) increases
- (b) decreases..
- (c) does not change
- (d) initially increases and then remains steady

42. Estimate the material removal rate in AJM of a brittle material with flow strength of 4 GPa. The abrasive flow rate is 2 gm/min, velocity is 200 m/s and density of the abrasive is 3 gm/cc

- A) $48 \text{ mm}^3/\text{min}..$
- B) $38 \text{ mm}^3/\text{min}$
- C) $32 \text{ mm}^3/\text{min}$
- D) $45 \text{ mm}^3/\text{min}$

43. Material removal rate in AJM is $0.5 \text{ mm}^3/\text{s}$. Calculate material removal per impact if mass flow rate of abrasive is 3 gm/min, density is 3 gm/cc and grit size is $60 \mu\text{m}$ as well as indentation radius.

- A) 9.78 mm

- B) 9.52 mm
- C) 9.65 mm
- D) 10.25 mm

44. Following are the abrasive materials are

- A) Al_2O_3
- B) Sodium carbonite(NaC)
- C) Resins
- D) Above all

45. Following are one of the compressed gas widely used in AJM process are

- A) CO_2, N_2
- B) SiO_2 ,
- C) NaCl
- D) None of this above.

46. Following are one of the density of the compressed Air in AJM process are

- A) 1.3 kg/m^3
- B) 2.3 kg/m^3
- C) 4.5 kg/m^3
- D) 5.5 kg/m^3

47. Following are the one of the velocity range of the AJM process are

- A) 120-150 m/s
- B) 500 ~ 700 m/s
- C) 150-250 m/s
- D) 300-450 m/s

48. Following are the one of the Pressure range of the AJM process are

- A) 12-15 bar
- B) 15-18 bar
- C) 2-10 bar
- D) 30-35 bar

49. Following are the one of the Limitation of the AJM process are

- A) MRR is rather low
- B) Tapering occurs due to flaring of the jet
- C) Environmental load is rather high.
- D) Above all.

50. WJM cannot be used to machine

- (a) frozen food
- (b) plywood
- (c) leather
- (d) steel plates....

51. In AWJM mixing process takes place in

- (a) intensifier
- (b) catcher
- (c) mixing chamber...
- (d) orifice

52. Abrasive water jet velocity increases with (keeping all other parameters unchanged)

- (a) increasing traverse velocity of the job
- (b) decreasing mass flow rate of abrasive...
- (c) decreasing traverse velocity of the job
- (d) increasing mass flow rate of abrasive

53. In an environment friendly development concerning AWJM, the following is used as abrasive

- (a) dry ice...
- (b) cubic boron nitrite
- (c) diamond
- (d) tungsten carbide

54. Assuming no losses, determine water jet velocity, when the water pressure is 4000 bar, being issued from an orifice of diameter 0.3 mm

- (a). 849 m/s..
- (b) 756 m/s
- (c) 897 m/s
- (d) 1235 m/s.

55. Determine the mass flow rate of water for the given problem assuming all related coefficients to be 1.

- (a) 4.54 kg/min
- (b) 3.79 kg/min...
- (c) 6.65 kg/min
- (d) 9.45 kg/min.

56. AJM nozzles are made of

- (a) low carbon steel
- (b) HSS
- (c) WC
- (d) Stainless steel

ANSWERS

37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
b	b	d	a	a	a	b	b	d	b	b	a	d	a	c	d	b	a	a	a

PART-B [2 Mark questions and answers]

57. State the working principle of Abrasive jet machining. .[AU, MAY-09, Apr-13]

In AJM process, a high speed stream of abrasive particles mixed with high pressure air or gas injected through a nozzle on the work piece to be machined.

58. What are the abrasives used in AJM process?

The various abrasive particles used in AJM process are aluminium oxide, silicon carbide, glass powder, dolomite and specially prepared sodium bicarbonate.

59. What are the material used for nozzle manufacturing in AJM process?[AU, MAY-10, MAY-12]

Tungsten carbide(WC)or synthetic sapphire are used as nozzle materials .Nozzle made of tungsten carbide have an average life of 12 to 20 hours whereas synthetic sapphire nozzle have an average life of 300 hours.

60. Name the carrier gases used in AJM process.[AU, MAY-09]

Nitrogen, carbon dioxide, helium or compressed air are used as carrier gases in AJM process.

61. What is the transfer medium in AJM? [AU, MAY-10]

Nitrogen, carbon dioxide, helium or compressed air are used as transfer medium in AJM process.

62. What are the desirable properties of carrier gas in AJM? .[AU, MAY-11]

1. It should be cheap.
2. It should be non-toxic.

3. It should be easily available.
4. It should dry quickly.
5. N₂, CO₂, He, etc, are normally used as carrier gas.

63. List any four advantage OF AJM process.

1. This process is suitable for cutting all materials. Even diamond can be cut by using diamond as abrasive
2. Initial investment is low.
3. It can be used to cut intricate hole shapes in hard and brittle materials.
4. There is no heat generation during this process. So, thermal damage to the work piece is avoided.

64. List any two disadvantage of AJM process.

1. Material removal rate is slow.
2. Soft material cannot be machined.

65. What are the application of AJM process? .[AU, MAY-09, MAY-11]

This process is widely used for

1. Machining of hard and brittle materials like quartz, ceramics, glass, sapphire, etc.
2. Fine drilling and micro welding.
3. Cleaning and polishing of plastics, nylon and Teflon components.
4. Machining of semiconductors.

66. What are the factors that affect the material removal rate in AJM process?

1. Mass flow rate.
2. Abrasive grain size.
3. Gas pressure.
4. Velocity of abrasive particles.
5. Mixing ratio and
6. Nozzle tip clearance.

Part-C(16 mark questions)

67. Describe principle and equipments for Abrasive Jet Machining.

68. Explain the principle of working of the AJM process with its advantages and disadvantages. [AU, DEC'07, MAY-10, MAY-11]

69. Explain the working principle of the WJM process with its advantages and disadvantages. [AU, DEC'08, MAY-11, MAY-12]

70. Explain the following in details:

- (i) Types of transducers for USM.
- (ii) Speed mechanism in USM. .[AU, MAY-10]
- (iii) USM typical applications.
- (iv) Abrasives for USM.

71. Explain the functions of transducer and horns used in USM. List the tools materials used. [AU, MAY-11]

72. Explain the working principle of the USM process with its advantages and disadvantages. [AU, MAY-12]

73. Briefly explain the effect of operating parameters on metal removal rate. List the applications of USM. [AU, MAY-09, MAY-10]

UNIT-III ELECTRICAL ENERGY BASED PROCESSES**PART-A****1 MARK**

74. For ECM of steel which is used as the electrolyte

- (a) kerosene
- (b) NaCl

- (c) Deionised water
- (d) HNO_3

75. MRR in ECM depends on

- (a) Hardness of work material
- (b) atomic weight of work material
- (c) thermal conductivity of work material
- (d) ductility of work material

76. ECM cannot be undertaken for

- (a) steel
- (b) Nickel based superalloy
- (c) Al_2O_3
- (d) Titanium alloy

77. Commercial ECM is carried out at a combination of

- (a) low voltage high current
- (b) low current low voltage
- (c) high current high voltage
- (d) low current low voltage

78. In electrochemical machining of pure iron a material removal rate of $600 \text{ mm}^3/\text{min}$ is required. Estimate current requirement.

- (a) $I = 635.8 \text{ A}$
- (b) $I = 785.5 \text{ A}$
- (c) $I = 268.8 \text{ A}$
- (d) $I = 3251 \text{ A}$

79. Composition of a Nickel superalloy is as follows: Ni = 70.0%, Cr = 20.0%, Fe = 5.0% and rest Titanium. Calculate rate of dissolution if the area of the tool is 1500 mm^2 and a current of 2000 A is being passed through the cell. Assume dissolution to take place at lowest valency of the elements.

$$A_{\text{Ni}} = 58.71 \quad \rho_{\text{Ni}} = 8.9 \quad v_{\text{Ni}} = 2$$

$$A_{\text{Cr}} = 51.99 \quad \rho_{\text{Cr}} = 7.19 \quad v_{\text{Cr}} = 2$$

$$A_{\text{Fe}} = 55.85 \quad \rho_{\text{Fe}} = 7.86 \quad v_{\text{Fe}} = 2$$

$$A_{\text{Ti}} = 47.9 \quad \rho_{\text{Ti}} = 4.51 \quad v_{\text{Ti}} = 3$$

- (a) 25.325 mm/min
- (b) 1.43 mm/min
- (c) 2.25 mm/min
- (d) 3.54 mm/min

80. In ECM operation of pure iron an equilibrium gap of 2 mm is to be kept. Determine supply voltage, if the total overvoltage is 2.5 V. The resistivity of the electrolyte is $50 \text{ } \Omega\text{-mm}$ and the set feed rate is 0.25 mm/min .

- (a) $V = 73.8 \text{ volt}$
- (b) $V = 65.35 \text{ volt}$
- (c) $V = 63.32 \text{ volt}$
- (d) $V = 3.54 \text{ volt}$

81. Following are one of the density of the compressed liquid in ECM process are

- A) 4.5 kg/m^3
- B) 45.25 kg/m^3
- C) 48.25 kg/m^3

D)55.25 kg/m³

82. Following are the one of the velocity range of the ECM process are

- A)120-150 m/s
- B)500 ~ 700 m/s...
- C)150-250 m/s
- D)300-450 m/s

83. Following are the one of the Pressure range of the ECM process are

- A)12-15 bar
- B)15-18 bar
- C) 2-10 bar
- D)30-35 bar

84. Following are the one of the Limitation of the ECM process are

- A)MRR is rather low
- B)Tapering occurs due to flaring of the jet
- C)Environmental load is rather high.
- D)Above all.

85. ECM cannot be used to machine

- (a) frozen food
- (b) plywood
- (c) leather
- (d) steel plates....

86. In ECM mixing process takes place in

- (a) intensifier
- (b) catcher
- (c) mixing chamber...
- (d) orifice

87. Electrolyte of the overall ECM

- (a) NaCl
- (b) KNO₃
- (c) H₂SO₄
- (d) Above all

88. In an environment friendly development concerning ECM, the following is used as abrasive

- (a) dry ice...
- (b) cubic boron nitrite
- (c) diamond
- (d) tungsten carbide

89. Following are one of the temperature of the ECM process are

- (a) 20 °C – 50 °C
- (b) 120 °C – 145 °C
- (c) 220 °C – 250 °C
- (d) 720 °C – 750 °C

90. MRR in ECM depends on

- (a) Hardness of work material
- (b) atomic weight of work material...
- (c) thermal conductivity of work material
- (d) ductility of work material

91. Following are one of the Dilution range of the ECM process

- (a) 100 g/l to 500 g/l

- (b) 600 g/l to 700 g/l
- (c) 700 g/l to 500 g/l
- (d) 1000g/l to 1500 g/l

92. The working gap between the tool and the work piece are

- (a) 0.001 mm to 0.02 mm
- (b) 0.1 mm to 2 mm..
- (c) 10.0 mm to 20 mm
- (d) 20.0mm to 30.0 mm

93. ECM can be classified as the following type of non-traditional machining process

- (i) electrical chemical process
- (ii) optical
- (iii) mechanical
- (iv) Thermal process

ANSWERS

74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
b	b	d	a	a	a	b	b	d	b	b	a	d	a	c	d	b	a	a	a

PART-B [2 Mark questions and answers]

94. What is the working principle of EDM process?[AU, MAY-10]

In EDM process, metal is removed BY producing powerful electric spark discharge between the tool and the work material.

95. What is the purpose of dielectric in EDM? [AU, MAY-09]

1. Its acts as an insulating medium.
2. It carries away the eroded metal particles along with it.
3. It cools the spark region and helps in keeping the tool and work piece cool.

96. What the basic requirements of tool material for EDM? [AU, Apr-13]

1. It has low erosion rate.
2. It should be electrically conductive.
3. It should have good machinability.

97. Name the common tool materials.

1. Copper.
2. Graphite.
3. Copper-Tungsten.

98. Define tool wear ratio. [AU, MAY-11]

The tool wear ratio is defined as the ratio of volume of work material removed to the volume of electrode consumed.

99. Give the wear ratio of non-metallic electrode:

For non metallic wear vary from 5:1 to 50:1

100. What are the advantages of EDM process?

1. Machining of very thin section is possible.
2. It does not leave any chips.
3. It is well suited for complicated components.

101. What are the disadvantages of EDM process? [AU, Apr-13]

1. It is only suited for machining electrically conductive materials.
2. It is suitable for machining small workpieces only.
3. Metal removal rate is low.

102. List the applications of wire-cut EDM.

It is best suited for the production of gears, tools, dies, rotors, turbine blades and cams for small to medium size production.

103. What is the function of servo mechanism in EDM? [AU, MAY-11]

The function of servo mechanism is to maintain very small gap, known as 'spark gap' ranges of .005 to 0.05 mm between the work piece and the tool.

Part-C (16 mark questions)

104. Explain the principle of working of EDM process with sketch. [AU-Dec'07, May-11, MAY-12]
105. What are the advantages and disadvantages of the EDM process? [AU, MAY-11]
106. Explain the principle of working of wire cut EDM process with a sketch. [AU-May'07, May-10]
107. List the advantages of wire cut EDM process. [AU, MAY-12]
108. What are the tools (electrodes) used in EDM process. [AU, MAY-09]
109. What are the functions of dielectric fluids used in EDM process? [AU, MAY-09]
110. Explain about metal removal rate and surface finish in EDM process?
111. Explain the following: i) R-C circuit; ii) R-C-L circuit; iii) Rotary pulse generator circuit; iv) Controlled pulse Generated circuit. [AU, MAY-10, MAY-11]

UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES**PART-A****1MARK****112. Which of the following material cannot be machined by EDM**

- (a) steel
- (b) WC
- (c) Titanium
- (d) Glass...

113. Which of the following is used as dielectric medium in EDM

- (a) tap water
- (b) kerosene
- (c) NaCl solution
- (d) KOH solution

114. Tool should not have

- (a) low thermal conductivity ...
- (b) high machinability
- (c) high melting point
- (d) high specific heat

115. EDM process is a

- (a) Electro Thermal process..
- (b) Thermal based process
- (c) Mechanical based process
- (d) Abrasive jet machining process.

116. EDM is mainly used to machine the

- (a) high strength temperature resistant alloys..
- (b) Low strength temperature alloys
- (c) Low strength temperature resins
- (d) High strength low alloys.

117. The followings are the different electrode materials which are used commonly in the industry:

- (a) Graphite
- (b) Electrolytic oxygen free copper
- (c) Tellurium copper – 99% Cu + 0.5% tellurium
- (d) Above all...

118. In a RC type generator, the maximum charging voltage is 80 V and the charging capacitor is 100 μ F. Determine spark energy.

- (a) 0.032 J
- (b) 0.32 J...
- (c) 0.0032 J
- (d) 0.00032 j

119. If in a RC type generator, to get an idle time of 500 μ s for open circuit voltage of 120 V and maximum charging voltage of 70 V, determine charging resistance.

Assume C = 100 μ F.

- (a) 6 ohm..
- (b) 60 ohm
- (c) 600 ohm
- (d) 0.60 ohm

121. For a RC type generator to get maximum power dissipation during charging

$V_c^* = V_o \times 0.716$. Determine idle time for $R_c = 10 \Omega$ and $C = 200 \mu$ F

- (a) $T_s = 0.1508$ ms
- (b) $T_s = 1.50085$ ms
- (c) $T_s = 1.58$ ms...
- (d) $T_s = 1.058$ ms

121. Determine on time or discharge time if $V_o = 100$ V and $V_d^* = 15$ V.

Spark energy = 0.5 J. Generator is expected for maximum power during charging.

Machine resistance = 0.5 Ω .

- (a) 6200 μ F
- (b) 620 μ F
- (c) 0.62 μ F
- (d) 62 μ F...

122. Identify the limitations of EDM from environmental issues

- (a) water recycling
- (b) chip recovery
- (c) spent water disposal
- (d) Above all

123. List quality parameters associated with EDM process

- (a) striation formation
- (b) tapering of the kerf
- (c) burr formation on the exit side
- (d) Above all.

124. List different modules of EDM systems

- A) Additive Mixer
- B) Accumulator
- C) A & B
- D) None of this..

125. The Dielectric Electrode should possess the following parameters are

- A) High electrical conductivity
- B) Higher density
- C) Easy manufacturability

D) Above all..

126. The different electrode materials which are used commonly in the industry are

- A) Tellurium copper – 99% Cu + 0.5% tellurium ..
- B) H₂SO₄
- C) KNO₃ solution with abrasives
- D) None of this.

127. Different power generators are used in EDM and some are listed below are

- A) B and C...
- B) Hybrid EDM generator
- C) Electronic pulse generator
- D) No need of power generators.

128. Mechanism of material removal in Electron Beam Machining is due to

- a) Mechanical erosion due to impact of high of energy electrons
- b) Chemical etching by the high energy electron
- c) Sputtering due to high energy electrons
- d) Melting and vaporisation due to thermal effect of impingement of high energy electron.....

129. Mechanism of material removal in Laser Beam Machining is due to

- a) Mechanical erosion due to impact of high of energy photons
- b) Electro-chemical etching
- c) Melting and vaporisation due to thermal effect of impingement of high energy laser beam.....
- d) Fatigue failure

130. Generally Electron Beam Gun is operated at

- a) Atmospheric pressure
- b) At 1.2 bar pressure above atmosphere
- c) At 10 – 100 mTorr pressure
- d) At 0.01 – 0.001 mTorr pressure....

131. In EDM process the cathode filament heated at

- a) 2500⁰ C.
- b) 250⁰ C.
- c) 500⁰ C.
- d) None of these.
- e)

ANSWERS

112	113	114	115	116	117	118	119	120	121
b	b	d	a	a	a	b	b	d	b
122	123	124	125	126	127	128	129	130	131
b	a	d	b	b	d	a	a	a	a

PART – B

2 MARK QUESTIONS AND ANSWERS]

132. State the principle of chemical machining process.

In chemical machining process, material is removed from the work piece through a controlled etching or chemical attack of the work piece material.

133. What is the purpose of etchants in chemical machining?

Etchants are used to remove the metal from the work piece. The metal is removed by the chemical conversion of the metal into metallic salt.

134. Name the etchants used in chemical machining process.

1. Caustic soda, 2. hydrochloric acid, 3. nitric acid, 4. Iron chloride.

135. What is the use of maskant in chemical machining?

In chemical machining process, the areas of the work piece which are not to be machined are covered with a resistant, called a resist or maskant.

136. Name some of the maskants used in CHM. [AU, APR-11]

1. Butyl rubber, 2. Neoprene rubber, 3. Polymers, 4. Polyethylene, etc.

137. Write the principle of ECM process. [AU-Dec'04, May-12]

ECM is based on the principle of Faraday's laws of Electrolysis and reverse electroplating. In this process, the work piece is connected to positive terminal (anode) and the tool is connected to negative terminal (cathode). When the current is passed, the work piece, the work piece loses electrolyte between the work and tool.

138. What are the requirements of tool materials in ECM process? [AU, APR-09]

1. It should be conductor of electricity.
2. It should be chemically inert to the electrolyte.
3. It should be easily machinable.

139. What are factors to be considered while designing the tool? [AU, APR-10]

1. Determine the tool shape, so that the desired shape of the job is obtained under existing machining conditions.
2. Design the tool by considering the electrolyte flow, insulation strength and fixing arrangements.

140. State the function of electrolyte used in ECM process? [AU, APR-09]

1. It carries the current between the tool and the work piece.
2. It cools the cutting zone which becomes hot due to the flow of high current.
3. It removes products of machining from the cutting zone.

141. Name any two electrolyte used in ECM. [AU-May'05]

20% of NaCl solution in water, mixture of brine and H₂SO₄, potassium salts and strong alkaline solutions are used as electrolyte in ECM process.

142. What are the process parameters of electro chemical machining? [AU-May'05]

1. Current density, 2. Gap between tool and work piece, 3. Type of electrolyte used. 4. Tool feed rate.

143. Write down the applications of the chemical milling process. [AU, May-12]

Machining complicated profiles, drilling small deep holes, machining of hard materials.

Part-C (16 mark questions)

144. Explain the ECM process. Explain how a replica of the tool is obtained. [AU, APR-11, May-10, May-12]

145. Explain the working principle of electrochemical discharge grinding and discuss the process capabilities. [AU, APR-10]

146. Explain the principle of ECG and ECH. [AU-May'07]

147. What are the main advantages, disadvantages and applications of ECM process?

148. List the requirements of tool material for ECM. Write the commonly used tool materials.

149. List the advantages, disadvantages and applications of ECG process. [AU, May-09]

150. Explain Electro-chemical honing process with neat sketch. [AU-May'07, May-11]

151. Write short notes on photo resist maskant, screen print maskant. [AU, May-12]

152. What are the factors influencing the selection of maskants in chemical machining process.

[AU, May-12]

UNIT – V THERMAL ENERGY BASED PROCESSES

PART-A

1MARK

153. Mechanism of material removal in Electron Beam Machining is due to

- a) Mechanical erosion due to impact of high of energy electrons
- b) Chemical etching by the high energy electron
- c) Sputtering due to high energy electrons
- d) Melting and vaporisation due to thermal effect of impingement of high energy electron

154. Mechanism of material removal in Laser Beam Machining is due to

- a) Mechanical erosion due to impact of high of energy photons
- b) Electro-chemical etching
- c) Melting and vaporisation due to thermal effect of impingement of high energy laser beam ...
- d) Fatigue failure

155. Generally Electron Beam Gun is operated at

- a) Atmospheric pressure
- b) At 1.2 bar pressure above atmosphere
- c) At 10 – 100 mTorr pressure
- d) At 0.01 – 0.001 mTorr pressure ...

156. Laser Beam is produced due to

- a) Spontaneous emission
- b) Stimulated emission followed by spontaneous emission
- c) Spontaneous emission followed by Spontaneous absorption
- d) Spontaneous absorption leading to “population inversion” and followed by stimulated emission ...

157. Which of the following material is not generally machined by USM

- a) Copper ...
- b) Glass
- c) Silicon
- d) Germanium

158. Tool in USM is generally made of

- a) Glass
- b) Ceramic
- c) Carbides
- d) Steel ...

159. Increasing volume concentration of abrasive in slurry would affect MRR in the following manner

- a) increase MRR...
- b) decrease MRR
- c) would not change MRR
- d) initially decrease and then increase MRR

160. USM can be classified as the following type of non-traditional machining process

- a) electrical
- b) optical
- c) mechanical ...
- d) chemical

161. Glass is being machined at a MRR of $6 \text{ mm}^3/\text{min}$ by Al_2O_3 abrasive grits having a grit dia of $150 \mu\text{m}$. If $100 \mu\text{m}$ grits were used, what would be the MRR?

- a) $4 \text{ mm}^3/\text{min}$...
- b) $5 \text{ mm}^3/\text{min}$
- c) $4.5 \text{ mm}^3/\text{min}$
- f) $7 \text{ mm}^3/\text{min}$

162. For the above problem, from the initial setting the frequency is increased from 20 kHz to 25 kHz. Determine new MRR.

- a) $10 \text{ mm}^3/\text{min}$
- b) $8 \text{ mm}^3/\text{min}$
- c) $7 \text{ mm}^3/\text{min}$
- d) $7.5 \text{ mm}^3/\text{min}$...

163. Glass is being machined at a MRR of $6 \text{ mm}^3/\text{min}$ by Al_2O_3 abrasive grits having a grit dia of $150 \mu\text{m}$. The feed force is increased by 50% along with a reduction in concentration by 70%. What would be the effect on MRR.

- a) $10 \text{ mm}^3/\text{min}$
- b) $8 \text{ mm}^3/\text{min}$
- c) $7 \text{ mm}^3/\text{min}$
- d) no change....

164. 1 Torr =

- a) 1mm of Hg...
- b) 0.1mm of Hg
- c) 10mm of Hg
- d) 100mm of Hg

165. USM is used in the type of material

- a) hardness
- b) malleable
- c) ductile
- d) brittle...

166. The transducer for USM works on the following principle

- a) Piezoelectric effect
- b) Magnetostrictive effect
- c) Electrostrictive effect
- d) all...

167. function of electron beam gun to generate

- a) charge particles
- b) free electrons...
- c) vibration
- d) none of these

168. Impact machining is one of the very few commercially feasible methods for machining which types of materials?

- a. Hard.
- b. Brittle.
- c. Frangible.

- d. All of the above.
e. None of the above.
- 169. The development of the electron beam machine was the direct result of the special needs of what industry?**
- a. Electronics.
b. Atomic energy.
c. Aerospace.
d. All of the above.
e. None of the above.
- 170. The electron beam machine is basically a source of what type of energy?**
- a. Thermal.
b. Sonic.
c. Fluid.
d. All of the above.
e. None of the above.
- 171. The electron beam technique cuts material by:**
- a. Alternately heating and cooling the area to be cut.
b. Vaporizing the material.
c. Making use of a pulsing technique.
d. All of the above.
e. None of the above.
- 172. Mechanism of material removal in Laser Beam Machining is due to**
- a) Mechanical erosion due to impact of high of energy photons
b) Electro-chemical etching
c) Melting and vaporisation due to thermal effect of impingement of high energy laser beam ...
d) Fatigue failure

ANSWERS

153	154	155	156	157	158	159	160	161	162
a	a	d	c	c	b	b	b	d	b
163	164	165	166	167	168	169	170	171	172
b	a	c	b	a	c	a	c	c	c

PART – B [2 Mark questions and answers]**173. State the working principle of EBM.[AU, MAY-11]**

When the high velocity beam of electrons strike the work piece, its kinetic energy is converted into heat. This concentrated heat raises the temperature of work material and vaporizes a small amount of it, resulting in removal of metal from the work piece.

174. Explain why EBM process is performed usually in a vacuum chamber. [AU, MAY-10]

1. To avoid collision of accelerated electrons with air molecules.
2. Protect the cathode form chemical contamination and heat losses.
3. The possibility of an arc discharge between the electrons is prevented.

175. Name two methods of focusing the electron beam. [AU, MAY-10]

1. Electromagnetic focusing, 2. Electrostatic focusing.

176. Why is the deflection coil is provided for electron beam machining? [AU-May'05]

The electromagnetic deflector coil is used to deflect the electron beam to different spot on the work piece. It can also be used to control the path of cut.

177. List any two advantages of EBM. [AU, MAY-09]

1. Very small holes can be machined in any type of material to high accuracy.
2. It is quicker process. Harder materials can also be machined at a faster rate than conventional machining.

178. What is the acronym of LASER? [AU-May'05, MAY-12]

Light amplification by stimulated emission of radiation is known as LASER. It is an electromagnetic radiation. It produces a powerful, monochromatic, collimated beam of light in which the waves are coherent.

179. List the limitations of EBM. [AU, MAY-11]

1. Highly skilled operators are needed,
2. Rate of production is low,
3. Initial investment is high,
4. Life of flash lamp is short.

180. What are the applications of EBM? [AU, MAY-09]

1. It is used for making very small holes, difficult welding of non-conductive and refractory materials, cutting complex profiles in thin and hard materials.
2. It can be used for mass micro-machining production.
3. It can also be used for selective heat treating of materials.

181. What is plasma? [AU, MAY-11]

When a flowing gas is heated to sufficiently high temperature of the order of 11,000⁰C to 28, 000⁰C, it becomes partially ionized and it is known as plasma.

182. State the working principle of PAM.

In plasma arc machining process, material is removed by directing a high velocity jet of high temperature (11,000⁰C to 28, 000⁰C) ionized gas on the work piece. This high temperature plasma jet melts the material of the work piece.

183. What are the gases used in PAM? [AU-May'05]

The commonly used gases are nitrogen hydrogen, air, mixture of nitrogen – hydrogen and argon – hydrogen, etc.

184. What are the types of plasma arc torches? [AU, MAY-11]

There are two types of plasma arc torches. They are :

1. Direct arc plasma torches or transferred arc type.
2. Indirect arc plasma torches or non-transferred arc type.

185. List any two advantages of PAM.

1. It can be used to cut any metal,
2. Cutting rate is high,
3. As compared to ordinary flame cutting process, it can cut plain carbon steel four times faster.

Part-C (16 mark questions)

186. Describe electron beam machining equipment. [AU-Dec'04, May-11]

187. Discuss the process parameters in EBM. [AU, MAY-12]

188. What are the applications of EBM process? [AU-May'05, May-10]

189. Describe laser beam machining equipment. [AU-Dec'04, May-11]

190. Explain any one method of producing laser. [AU-May'05]

191. Explain the machining applications of laser.

192. Explain plasma arc machining process. [AU-Dec'04, May-10, May-12]

193. Discuss about PAM process parameters. [AU- Dec'04, May-10]

194. What are the types of lasers used for material processing applications? Describe how the system can be used for machining purposes. [AU, MAY-12]

195. Write down the advantages, disadvantages and applications of Electron beam Machining process. [AU, MAY-12]

*******ALL THE BEST*******

