NOORUL ISLAM COLLEGE OF ENGINEERING, KUMARACOIL

Mechanical Engineering (Two mark Questions and answers)

SEM: VII **ME 1008 –Robotics**

UNIT 1

1.Name the commonly used robot configuration system ?

The commonly used robot configuration system are

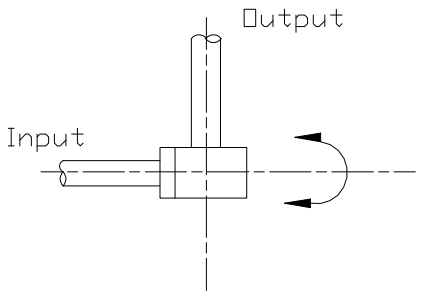
- Cartesian coordinate system
- Cylindrical coordinate system
- Polar or spherical coordinate system
- Revolute coordinate system

2.Name the important parts of harmonic drive ?

The important parts of harmonic drives are

- Rigid circular spline with internal teeth
- Flex spline with external teeth
- Elliptical wave generator

3.Sketch the revolving joint and show the relative joint motions ?



4.Define a Robot?

RIA defines arobot as a "programmable , multifunction manupulator designed to Move materials, parts ,tools or special devices through variable programmed motions for the performance of the variety of tasks ".

5. State the advantages and limitations of a hydraulic drive?

Advantages :-

- It gives greater speed and strength.
- It gives highest power to weight ratio .
- It is used for heavy pay loads.
- It can be used for large working envelope.
- It is safe and reliable to work in wet and dirty conditions.

- It can be used in hazardous enviroinment.

Disadvantages:-

*It occupies more space.

- Maintanance should be done regularly.

6. What are the types of hydraulic actuators ?

The types of hydraulic actuators are

* Linear hydraulic actuator
  - Single acting cylinder
  - Double acting cylinder
  - Double acting double rod cylinder

*Hydraulic rotary actuator

- Gear motor
- Vane motor
- Piston motor

7.What is meant by workspace?

The space in which the end point of the robot arm is capable of operating is called as workspace in other words reachability of robot arm is known as workspace.

8. What is meant by work volume?

The volume of the space swept by the robot arm is called work volume.

9. What is meant by work envelop ?

The work envelop is described by the surface of the work space.

10. What is meant by accuracy of Robot ?

The robot's ability to reach a reference point with in the robot's full work volume is known as accuracy of robot .

11.What is meant by pay load capacity of Robot ?

The maximum load which can be carried by the manupulator at low or normal speed .

12. What is meant by precision of Robot ?

It is the smallest increment of motion for which the robot can be controlled

13.What is repeatability of Robot?

Repeatability refers to robot's ability to return to the programmed point when it is commanded to do so.

14.What is meant by quality of Robot?

A Robot is said to be high quality when the precision and accuracy is more .

15. Classify the motion control of Robot arm?

- Limited sequence control
- Point to Point control
- Continuous path control
- Intelligent control

UNIT 11

16. Define End effector:-

End effector is a device that is attached to the end of the wrist arm yo perform specific task .

17. Give some examples of Robot End effector:-

- Gripper

- Tools
- Welding equipments
- End of arm Tooling (EOAT)

18. What is meant by Gripper?

Gripper is the End effector which can hold or grasp the object .

19. What are the types of Grippers?

- Magnetic Gripper
- Mechanical Gripper
- Hooking Gripper
- Vacuum Gripper

20.What is a stripping device?

A device used to remove workpiece from the magnetic gripper

21 What are the types of mechanical Grippers?

Linkage actuation gripper
Gear and rack actuation gripper
Cam actuated gripper
Screw actuated gripper

22. Give some examples of tool as Robot End effector

Spot Welding Tools
Arc welding Torch
Spray painting nozzle
Water jet cutting tool

23 What is transfer function :-

The transfer function relates the Laplace transformation of the system output to an Laplace transformation of the system input.

24.What is summing junction :-

Summing junctions may have any number of arrows entering but only one leaving .

25. What is a take of point?

Take of points permit signals and variables to be shared among more than a single component

26. What is a functional block?

Functional block represents one of the components of the system and contains the transfer function for the component.

27. What is a signal arrow?

Signal arrow indicates the direction of variables and signals in the diagram.

28.Name some feedback devices used in robotics?

- potentiometer
- resolver
- encoder

29.What are the types of encoders?

A. Linear encoder
B. Rotary encoder
(i)Absolute encoder
(ii)Incremental encoder

30.What is forward kinematics?
It is a scheme to determine joint angles of a robot by knowing its position in the world coordinate system
31.What is reverse kinematics?
It is a scheme to determine the position of the robot in the world coordinate system by knowing the joint angles and the link parameters of the robot.
32 List the various actuating mechanisms used in mechanical grippers.
- Linkage actuation gripper
- Gear and rack actuation gripper
- Cam actuated gripper
- Screw actuated gripper

33. What is the principle of vacuum cup?
The principle used in vacuum pump and Venturi

UNIT 111

34.What is frame grabber?
It is a hardware device used to capture and store the digital image.
35.What is the common imaging device used for robot vision system?
Black and white vidicon camera, charge coupled devices, solid state camera, charge injection devices.
36.What is pixel?
Picture elements are also known as pixels
36.What is a frame of a vision data?
The digital image of the camera is called frame of vision data
37.What is segmentation?
Segmentation is the method to group areas of an image having similar characteristics or features into distinct entities representing part of the image.
38. What is thresholding?
Thresholding is a binary conversion technique in which each pixel is converted into a binary value either black or white.
39.What is region growing?
Region growing is a collection of segmentation techniques in which pixels are grouped in regions called grid elements based on attribute similarities.
40.What are the functions of machine vision system?
- Sensing and digitizing image data
- Image Processing and analysis
- Application

41. What are the applications of machine vision system?
- Inspection
- Identification
- Visual Servoing and navigation

42.What is a sensor?
Sensor is a transducer that is used to make a measurement of a physical variable of interest.
43.What is a transducer?

Transducer is a device which convert the one form of information into another form without changing the information content

44 What are the basic classifications of sensors?

Tactile Sensors, Proximity Sensors, Range sensors, Voice sensors etc

45. What are the desirable features of a sensor?

Good Accuracy, High Precision, Wide operating range, Instant speed of response, Good Repealibility, Low cost and ease in operation

46 What is a tactile sensor?

Tactile sensor is device which indicate the contact between themselves and some other solid objects.

47 List the different types of tactile sensor?

Digital (Touch) Sensor and Analogue (Force) Sensor

48.What is a touch sensor?

Sensor which senses the presence or absence of the object by having physical contact between the object

49. List the components of the force wrist

Metallic frame, Bracket for tool mounting and strain gauges.

50 What is a tactile array sensor?

Tactile array sensor is a special type of force senor composed of a matrix of force sensing elements.

51. What is a Proximity sensor?

Sensor which senses the presence or absence of the object without having physical contact between the object

52. What are the classifications of a proximity sensor?

Inductive Sensor

Capactive Sensor

Ultrasonic Sensor

Magnetic Sensor

53. What is a range sensor?

Sensor which senses the range of the object

54 What is a voice Sensor?

It is a advanced sensor system used to communicate commands or information orally to robot.

55 What is a vision Sensor?

It is a advanced sensor system used in conjunction with pattern recogonization and other technique to view and interpret event occurring in the robot work space.

56 What is a potentiometer?

Potentiometer is an electrical meter to measure the voltage.

57 What is inspection?

It is the quality control operation in which the checking of part assembly or products for conformance to certain criteria is specifying by the design engineering department .

58 What is meant by quantisation?

Each sampled discrete time voltage level is assigned to a finite no of amplitude levels.These amplitude levels correspond to the gray scale used in the

system .The predefined amplitude levels are characteristic to a particular AtoD converter and consist of discrete values of voltage levels is defined by

Number of quantisation levels $=2^n$

Where n is the no of bits of the A/D converter

59 What is meant by encoding :-

Encoding is defined as the representation of an amplitude level by a binary digit sequence .

60. What is meant by sampling :-

The given analog signal is sampled periodically to obtain a series of discrete time analog signals .

61 What are the basic lighting devices :-

i. Diffuse surface devices
ii. Condenser projectors
iii. Flood or spot projectors
iv. Collimators
v. Imagers

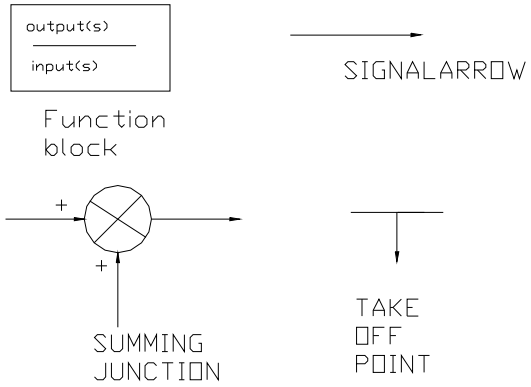
62 What are the phases of A/D conversion

vi. Sampling
vii. Quantization
viii. Encoding

63. What are the various techniques in image processing & analysis:-

1.Image data reduction
2. Segmentataion
3. Feature extraction
4. Object recognition

64Give the block diagram of function block , signal arrow , summing junction & take off point ?



65.What is meant by image data reduction ?

The objective of image data reduvtion is to reduce the volume of the data .

66. What are schemes involved in image data reduction :-

a. Digital conversion
b. Windowing

67. What is meant by windowing :-

Windowing involves using only a portion of the total image stored in the frame buffer for image processing and analysis this portion is called window .

68. What is meant by Digital conversion :-

Digital conversion reduces the no of gray levels used by the machine vision system .

69. What is meant by segmentation :-

The objective of segmentation is to group areas of an image having similar characteristic or features into distinct entities representing parts of the image .

70. What are the technique involved in segmentation :-

a. Thresholding
b. Region growing
c. Edge detection

71. What is meant by thresholding :-

Thresholding is the binary conversion technique in which each pixel is converted into a binary value .

72. What is meant by Region growing :-

Region growing is the collection of segmentation techniques in which each pixels are grouped in regions called grid elements .

73. What is meant by edge detection :-

Edge detection considers the intensity change that occurs in the pixels at the boundary or edges of part .

74. What is meant by Feature extraction :-

Feature extraction is usually accomplished by means of features that uniquely characterize the object .

75. What are techniques used in Object recognition :-

a. Template matching technique
b. Structural technique

76. What is meant by Template matching techniques :-

Template matching techniques are a subsets of the more general statistical pattern recognition technique .

77. What is meant by structural technique :-

Structural technique of pattern recognition consider relationships between the features or edges of an object .

UNIT 1V

78 What are the methods of Robot programming :-

a. Lead through methods
b. Texual robot languages
c. Mechanical Programming

79 What are ways of accomplishing lead through programming :-

Powered Leadthrough
Manual Lead through

80. What is teach pendant

The teach pendant is usually a small handheld control box with combinations of toggle switches ,dials and buttons to regulate the robot's physical movements and program capabilities .

81 What are the methods of teaching :-

Joint movements
X-Y-Z coordinate motions
Tool coordinate motions

UNIT 5

82. What is palletizing?

Palletizing is the operation in which the robot picks cartons from a conveyor and place them on to a Pallet.

83. What is depalletizing ?

Depalletizing operation is the reverse of palletizing operation in which the robot removes cartons from the pallet and places them on to a conveyor or other location.

84. What are the different types of material handling operation ?

- picking and placing
- Palletizing and depalletizing
- Machine loading and unloading
- Parts feeding ,storage and retrival
- Sorting of the parts from conveyors.

85. Which type of robot is commonly used for pick and place operation?

Cylindrical coordinate Robot is commonly used for pick and place operation

86.What do you meant by material transfer application ?

Material transfer applications are defined as operations in which the primary objective is to move a part from one location to another location.

87. What is pick and place operation ?

Pick and place operations involved tasks in which the robot picks the part at one location and moves it another location.

88. What are Gantry Robots ?

If the robots are mounted over head ,they are called Gantry Robots.

89.How the workpieces are fed to the Robot by some mechanical feeding device ?

The workpieces are fed to the robot by some mechanical feeding device or conveyor in a known location and orientation

90. What is the interpretation of manufacturing system ?

Manufacturing system is defined as the system which converts the input into a suitable output .

91. What are the technology used in manufacturing system ?

- COMPUTER AIDED DESIGN/COMPUTER AIDED MANUFACTURING
- FMS
- CIM
- AGILE
- LEAN

92. Define the term"CIM"

The term CIM denotes the use of computer pervasive use of computer system to design the products , plan the production ,control the operations and perform the various business related functions

93. Write down some elements of CIM?

LAN,DATABASE,FEM,QC,CNC,TOOL DESIGN, MARKETING, COMPUTER AIDED DESIGN, ANALYSIS,ROBOT SCHEDULING .

94. What are parts feeding ,storage and retrieval process?

*part feeding means feeding the part to the machine.

*storage means storing different types of object in the pallet.

*retrieval is the process of taking the object from the pallet.

95. What is a pallet?

Pallet is a storage area which consists of a number of cells to store workpiece of different size.

96. Differentiate palletizing and depalletizing

palletizing	Depallatizing
a.The pick up point is constant.	a.The pick up point is different.
b.The delivery point is different.	b.The delivery point is constant.

97.Application of robot in loading and unloading

a. Die casting
b. Injection moulding
c. Forming ,stamping
d. Trimming process

98. What is assembly?

The term assembly is defined to mean the fitting of two or more discrete parts to form a new subassembly.

99) Define part presentation.

Inorder to perform an assembly task the part that is to be assembled must be presented to robot .this is part presentation.

100) Explain bowl feeders ?

Bowl feeders are devices used for feeding and orienting small parts in automated assembly operations. They are made two main components

- The bowl
- The vibrating base

101) What are the types of assembly operation?

- Parts mating
- Parts joining

102.Basic configurations of assembly systems?

- A single workstation assembly
- A series of work station assembly
- Combination of both .

103.What is APAS ?

Adaptable Programmable Assembly system was developed by National Science Foundation & Westing House Electric Corporation .The purpose was to advance the state of the art in automated batch assembly .

104.Explain Designing for Robotic assembly :-

- Certain assembly tasks are very difficult for the robot to perform than others . If possible ,this difficulty factor should be considered in the design of product .
- Another consideration in the design of an assembly is the direction in which the parts are to be added in the assembly operation

ESSAY TYPE QUESTIONS WITH KEYS

1. What are the types of robots?
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 22-27
2. What are the drives used in robots?
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 33-35
3. What are the basic motions of robots?
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 35- 37
4. What are feed back devices used in robots?
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 67-72
5. What are the actuators used in robots?
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 72-79
6. Explain forward and reverse kinematics.
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 88-100
7. Explain robot dynamics.
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 106-111
8. Explain types of gripper.
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 118- 132
9. What are the methods of programming used in robots?
   Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 190-194

10.Explain touch and force sensor in detail.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 147 -153
11. Explain proximity and range sensor
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 153-156
12. Explain machine vision in detail.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 161-183
13. Explain the application of robots in welding.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 392-402
14. Explain the application of robots in assembly.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 416-447
15. Explain the application of robots in material handling.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 375-382
16. Explain the application of robots in loading and unloading.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 382-386
17. Explain the application of robots in machining.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 387-391
18. Explain the application of robots in remote and hostile environment.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 525-533
19. Explain robot end effector interface.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No. 134-136
20. Explain artificial intelligence.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 290- 300
21. Write a program for pick and place.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 268- 289
22. Explain image processing and analysis technique
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 172-180
23.What are the types of imaging tecniques used in robotics.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 164-167
24.What are the motion interpolation tecniques used for robot programming
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 197-201
25. Explain robot programming in detail.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 201-276
26.Explain Artificial Intelligence and robotics.
Refer INDUSTRIAL ROBOTICS by Mitkell P.Groover Pg. No 305