

Code No: 07A80307

R07**Set No. 2**

IV B.Tech II Semester Examinations, April/May 2012

AUTOMATION IN MANUFACTURING

Common to Mechanical Engineering, Mechatronics, Automobile Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

1. (a) Discuss the important categories of machine tool control strategies.
(b) What are the different types of automation? Discuss them briefly. [8+8]
2. (a) Describe the liquid based Rapid Prototyping system with the help of neat sketch.
(b) State the applications of Concurrent Engineering. [8+8]
3. Draw the neat sketches of the following mechanisms and discuss briefly:
 - (a) Ratchet and Pawl mechanism.
 - (b) 'Over and Under' type chain drive mechanism.
 - (c) Cam mechanism.
 - (d) Walking Beam mechanism. [16]
4. What is the objective of Adaptive Control with Constraints? Draw the block diagram of a typical computerized Adaptive Control with Constraints system for drilling operation and explain in detail. [16]
5. (a) What is manual single station assembly and 'manual assembly line'? Enumerate the differences between them.
(b) A manual production flow line is arranged with six stations and a conveyor system is used to move parts along the line. The belt speed is 1.8 m/min and the spacing of raw workparts along the line is one for every 1.35 m. The total line length is 13.5 m, hence each station length equals 2.25 m. Determine the following:
 - i. Feed rate.
 - ii. Tolerance time.
 - iii. Theoretical cycle time. [6+10]
6. (a) Explain the various problems encountered in interfacing handling and storage systems with manufacturing units.
(b) What are the special features of AS/RS components? Discuss briefly. [8+8]
7. (a) Discuss the following factors in materials handling equipment:
 - i. Routing.
 - ii. Scheduling.

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(b) Explain the following terms used in the analysis of vehicle based system:

- i. Availability.
- ii. Traffic factor.
- iii. Worker Efficiency.
- iv. Traffic congestion.

[8+8]

8. The following data apply to a 12-station in-line transfer machine:

$P = 0.01$ (all stations have an equal probability of failure)

$T_c = 0.3$ min

$T_d = 3.0$ min

Using the lower-bound approach, compute the following for the transfer machine:

- i. The frequency of line stops.
- ii. The average production rate.
- iii. The line efficiency.

[16]

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1. (a) Describe the following features of an Automated Storage and Retrieval System:
 - i. Aisle transfer cars.
 - ii. Fully/Empty bin detectors.
 - iii. Sizing stations.
 - iv. Load identification station.(b) Discuss the different applications of AS/RS technology. [8+8]
2. (a) With the help of neat sketches, explain the following linear transfer mechanisms:
 - i. Powered Roller Conveyor System.
 - ii. Walking Beam Transfer System.(b) Explain the advantages and limitations of synchronous transfer mechanisms. [10+6]
3. (a) Define 'Fixed Automation' and 'Flexible Automation'. Enumerate the differences between them.
(b) What are the important pneumatic components used in automated system? Describe briefly. [8+8]
4. (a) Explain briefly following assembly systems:
 - i. Manual single-stations assembly system.
 - ii. Automated assembly system.(b) A manual production flow line is arranged with six stations and a conveyor system is used to move parts along the line. The belt speed is 120 cm/min and the spacing of raw workparts along the line is one for every 90 cm. The total line length is 900 cm, hence each station length equals 150 cm. Determine the following:
 - i. Feed rate.
 - ii. Tolerance time.
 - iii. Theoretical cycle time. [6+10]
5. (a) Explain the following liquid based Rapid prototyping techniques:
 - i. Solid Ground Curing.
 - ii. Droplet deposition manufacturing.

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- (b) Discuss the benefits of Business Process Reengineering techniques. [8+8]
6. (a) Discuss the important steps to be considered to implement the automated flow lines in the manufacturing system.
- (b) In a 10 station transfer line, the probability that a station break down will occur for a given work part is equal to 0.01. This probability is the same for all 10 stations. Determine the frequency of line stops per cycle on this flow line using the upper bound approach and also calculate the production rate. [8+8]
7. (a) Discuss the importance of vehicle management and safety in Automated Guided Vehicle System.
- (b) Describe the following cranes:
- Bridge crane.
 - Gantry crane. [8+8]
8. With the help of a neat block diagram, discuss the Adaptive Control with Optimization for drilling process to obtain the optimal process parameters. [16]

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1. (a) Explain the various applications of carousel storage systems.
(b) Explain the various objectives for installing an automated storage system in a factory. [8+8]
2. (a) Define 'Lower bound approach' used in the analysis of transfer lines without storage buffer and explain with suitable example.
(b) Briefly discuss the following related to the efficiency of an automated flow lines:
 - i. Efficiency of line with storage buffer.
 - ii. Efficiency of line without storage buffer. [8+8]
3. Draw the block diagram of Adaptive Control with Optimization system for grinding operation and explain each block in detail. [16]
4. (a) Discuss the series of specifications that are to be considered to decide some form of automated flow line that represents the best design and fabrication method.
(b) Explain the working of 'over and under' type chain-drive conveyor system transfer mechanism with the help of neat sketch. [8+8]
5. (a) Draw the block diagram of manual assembly line and explain briefly.
(b) Explain the following techniques for solving large-scale line balancing problems:
 - i. COMSOAL.
 - ii. CALB. [6+10]
6. (a) What are the various features of monorail guided vehicles? Discuss their typical applications.
(b) What are asynchronous conveyor systems? Describe them briefly. [8+8]
7. What are the important pneumatic components used in automated system? Describe briefly. [16]
8. (a) Explain the objectives of Concurrent Engineering.
(b) Define 'Business Process Reengineering' and discuss how the model of Business Process Reengineering works. [8+8]

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1. (a) Discuss the important general terminology used in the analysis of the automated flow lines.
(b) What are the two basic approaches used in the analysis of transfer lines without storage? Explain them briefly. [6+10]
2. (a) Discuss the powder based Rapid Prototyping system with the help of neat sketch.
(b) Define Concurrent Engineering and discuss the goals of Concurrent Engineering. [8+8]
3. What is Kilbridge and Westers method? What are its advantages over Largest Candidate Rule method? Write the procedures to solve the line balancing problem by using:
(a) Largest Candidate Rule Method and.
(b) Kilbridge and Westers Method. [16]
4. (a) Draw the general structure of a hydraulic circuit and explain the important components involved in it.
(b) Define 'automation'. Discuss the reasons for implementation of automated systems in the manufacturing industries. [8+8]
5. What is the objective of Adaptive Control with Constraints? Draw the block diagram of a typical computerized Adaptive Control with Constraints system for turning and explain in detail. [16]
6. Briefly describe the following AS/RS units:
(a) Unit load AS/RS.
(b) Mini load AS/RS.
(c) Man-on-board AS/RS.
(d) Automated item retrieval system. [4×4]
7. (a) Explain the salient factors on which the most appropriate type of transport system for a given application depends.
(b) A Geneva with eight slots is used to operate the worktable of a dial indexing machine. The slowest workstation on the dial indexing machine has an operation time of 2.5 seconds, so the table must be in a dwell position for this length of time:

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- i. At what rotational speed must the driven member of the Geneva mechanism be turned to provide this dwell time?
 - ii. What is the indexing time in each cycle? [6+10]
8. (a) Discuss the following technologies used in the systems for vehicle guidance:
 - i. Self Guided Vehicles.
 - ii. Imbedded guide wires.
- (b) What are single direction conveyors and continuous loop conveyors? Discuss them briefly. [8+8]

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