

IV B.Tech I Semester Regular Examinations, November 2007
AUTOMATION IN MANUFACTURE

(Common to Mechanical Engineering and Production Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) List out the various hydraulic components that can be used in automated manufacturing systems. Explain them briefly.
(b) Describe the function and working of the following automated machine tools:
 - i. Single Station Machine
 - ii. Rotary Indexing Machine. [8+8]
2. (a) What are the different types of control function that are required in an automated flow line? Discuss them briefly.
(b) In the operation of a six-slotted Geneva mechanism, the driver rotates at 6 rpm. Determine the cycle time of the indexing machine, the process time and the time spend each cycle in indexing the table to the next work position. [8+8]
3. (a) Explain the efficiency of flow line when flow line is having storage buffers with infinite capacity.
(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 lower bound approach and also calculate the production rate. [8+8]
4. What is Kilbridge and Wester's 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 Wester's Method. [16]
5. What are the different types of material handling equipment associated with the different plant layouts? Discuss them briefly. [16]
6. (a) Explain the following components of an AS/RS:
 - i. Storage/Retrieval machine
 - ii. Storage modules.(b) "The work-in-process storage systems are a systematic method for managing work-in-process in batch production factories"-Explain the reasons. [8+8]

Code No: RR410310

Set No. 1

7. Draw the block diagram of Adaptive Control with Optimization system for milling and explain each block in detail. [16]
8. (a) Describe the liquid based Rapid Prototyping system with the help of neat sketch.
(b) State the applications of Concurrent Engineering. [8+8]

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1. (a) Describe the principle and working of the following automated machine tools:
 - i. Trunion Machine
 - ii. Centre Column Machine.
- (b) Define 'Fixed Automation' and 'Flexible Automation'. Enumerate the differences between them. [8+8]
2. (a) Discuss the following two rotary transfer mechanisms with the help of neat sketches:
 - i. Cam Mechanism
 - ii. Rack and Pinion Mechanism
- (b) Enumerate the differences between various workpart transport methods. [10+6]
3. (a) Discuss the analysis of the performance of a partially automated flow line without buffer storage.
- (b) What are the reasons for the implementation of automated flow lines in the production units? Explain briefly. [8+8]
4. (a) Briefly discuss the following assembly processes:
 - i. Mechanical fastening
 - ii. Joining methods
- (b) What are the various techniques for solving large scale line balancing problems based on the use of the computer? Describe any one technique. [8+8]
5. What are the different types of material handling equipment associated with the different plant layouts? Discuss them briefly. [16]
6. (a) Explain the following terms used in automated storage systems:
 - i. Storage capacity
 - ii. Utilization
 - iii. System throughput
 - iv. Uptime reliability.
- (b) Discuss the important applications of carousal storage systems. [8+8]
7. Draw the block diagram of Adaptive Control with Optimization system for turning process and explain each block in detail. [16]

Code No: RR410310

Set No. 2

8. (a) Which type of RP techniques is best suited for production of ceramic parts?
Explain the process.
- (b) Draw the block diagram of ERP and explain briefly. [8+8]

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1. (a) Define 'automation'. Discuss the reasons for implementation of automated systems in the manufacturing industries.
(b) Explain how the efficiency of manufacturing plant can be improved by employing the following automation strategies:
 - i. Integrated Operations
 - ii. Process Control Optimization
 - iii. Increased Flexibility
 - iv. Computer Integrated Manufacturing. [8+8]

2. (a) With the help of neat sketches, explain the following linear transfer mechanisms:
 - i. Walking Beam Transfer System
 - ii. Chain Drive Conveyor System(b) Enumerate the differences between synchronous and asynchronous transfer mechanisms. [10+6]

3. (a) Explain 'Upper bound approach' and 'Lower bound approach'. Enumerate the differences between these two approaches.
(b) Explain the following terms used in the analysis of an automated flow lines:
 - i. Partial automation
 - ii. Lower bound approach [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 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) Discuss the following technologies used in the systems for vehicle guidance:

- i. Self Guided Vehicles
 - ii. Imbedded guide wires.
- (b) What are single direction conveyor and continuous loop conveyor? Discuss them briefly. [8+8]
6. How do you classify the AS/RS systems? Explain them in brief. [16]
7. With the help of a neat block diagram, discuss the Adaptive Control with Optimization for turning operation to obtain the optimal process parameters. [16]
8. What is Rapid Prototyping? Explain what type of materials can be processed by Rapid Prototyping techniques. Discuss the advantages and limitations of Rapid Prototyping Techniques. [16]

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1. (a) What are the different types automation? Discuss them briefly.
(b) Draw the simple block diagram of pneumatic circuit and discuss it briefly. [8+8]

2. (a) Illustrate the working of walking beam transfer system with the help of neat sketches.
(b) The driver rotates at 5 rpm in the operation of a four-slotted Geneva mechanism. Determine the cycle time of the indexing machine, the process time and the time spent each cycle in indexing the table to the next work station. [8+8]

3. (a) Explain how the efficiency of the flow line increases by adding one or more parts storage buffers between work stations along the line.
(b) Discuss the analysis of a two-stage automated flow line. [8+8]

4. (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]

5. (a) Discuss the following factors in materials handling equipment:
 - i. Routing
 - ii. Scheduling.
(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]

6. (a) What are the problems encountered in interfacing AS/RS units to the manufacturing function? How these can be overcome?
(b) Define 'work-in-process' and discuss use of automated work-in-process storage systems. [8+8]

Code No: RR410310

Set No. 4

7. Draw the block diagram of Adaptive Control with Optimization system for grinding operation and explain each block in detail. [16]
8. (a) What are the advantages of various Rapid Prototyping techniques?
(b) Briefly explain the software configuration of Business Process Reengineering. [8+8]
