

**IV B.Tech I Semester Supplementary Examinations, February 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**

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1. (a) Discuss the following automated machine tools:
  - i. Rotary Indexing Machine
  - ii. Transfer Machine.(b) Explain the following two types of machine tool control systems:
  - i. Open loop Control System
  - ii. Closed loop Control Systems. [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. (a) What are the three major processes used to accomplish the assembly of the components? Explain briefly.  
(b) Enumerate the differences between flexible assembly lines and manual assembly lines. [8+8]
5. Discuss the important factors to be considered in material handling system design. [16]
6. (a) Discuss the advantages of using Automated storage systems in a warehouse.  
(b) What are the various problems encountered in interfacing handling and storage systems with manufacturing units? Discuss them briefly. [8+8]
7. Draw the block diagram of Adaptive Control with Optimization system for milling and explain each block in detail. [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) 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]
2. With the help of neat sketches explain the following transfer mechanisms:
  - (a) Walking Beam Mechanism
  - (b) Chain Drive Conveyor Mechanism
  - (c) Geneva Mechanism
  - (d) Rack and Pinion Mechanism. [4x4=16]
3. (a) What is 'partial automation' and what are the reasons for the existence of partially automated production lines in the shop floors?  
(b) Discuss the following terms used in the automated flow lines:
  - i. Starving of stations
  - ii. Blocking of stations. [8+8]
4. (a) What are the three major processes used to accomplish the assembly of the components? Explain briefly.  
(b) Enumerate the differences between flexible assembly lines and manual assembly lines. [8+8]
5. (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]
6. (a) Discuss the advantages of using Automated storage systems in a warehouse.  
(b) What are the various problems encountered in interfacing handling and storage systems with manufacturing units? Discuss them briefly. [8+8]
7. Draw the block diagram of Adaptive Control with Optimization system for milling and explain each block in detail. [16]
8. (a) Describe briefly about the following solid based RP systems:
  - i. Laminated Object Manufacturing

ii. Fused Deposition Modelling

- (b) What are the different methodologies available in Business Process Reengineering? Discuss them briefly. [8+8]

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1. (a) Explain the following types of automation:
  - i. Fixed Automation
  - ii. Flexible Automation.
- (b) Describe the function and working of the following automated machine tools:
  - i. Transfer Machine
  - ii. Single Station Machine. [8+8]
2. (a) Discuss the general methods of transporting work pieces on flow lines.
- (b) Discuss the advantages and limitations of the continuous transfer mechanisms. [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 terms used in line balancing:
  - i. Cycle Time
  - ii. Precedence Constraints
  - iii. Balance Delay
- (b) The total work content time of a certain assembly job is 7.8 min. The estimated downtime of the line is  $D = 5\%$  and the required production rate is  $R_p = 80$  units/hour.
  - i. Determine the theoretical minimum number of workstations required to optimize the balance delay.
  - ii. For the number of stations determined in part (i), compute the balance delay d.
  - iii. What feed rate should be specified if a moving belt line is to be used? [6+10]
5. (a) Explain why is the plant layout is an important factor in the design of a material handling system.
- (b) What is cart-on-track conveyor? How it differs from belt conveyor? [8+8]
6. (a) Explain the following performance criteria by which the performance of automated storage systems can be measured:

- i. Storage capacity
  - ii. System through put
  - iii. Utilization
  - iv. Uptime reliability.
- (b) Explain with the help of neat sketch the configurations of work-in-process storage systems and their relationship to manufacturing. [8+8]
7. Draw the block diagram of Adaptive Control with Optimization system for drilling process and explain each block in detail. [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 important pneumatic components used in automated system?  
Describe briefly.
- (b) Discuss the following automation strategies that can be employed to improve productivity in manufacturing operations:
  - i. Specialization of Operations
  - ii. Increased Flexibility
  - iii. On-Line inspection
  - iv. Computer Integrated Manufacturing. [8+8]
2. (a) Discuss the general methods of transporting work pieces on flow lines.
- (b) Discuss the advantages and limitations of the continuous transfer mechanisms. [10+6]
3. (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]
4. (a) Briefly discuss the following assembly processes:
  - i. Adhesive bonding
  - ii. Joining Methods
- (b) With the help of suitable example explain the procedure to solve the line balancing problem by Kilbridge and Wester's Method. [6+10]
5. (a) Discuss the following factors in material handling equipment:
  - i. Flow rate of materials
  - ii. Routing factors.
- (b) When the cranes are in manufacturing industries? Describe the different types of cranes used for material handling. [8+8]
6. (a) Explain the reasons that justify the installation of an automated storage system for work-in-process.
- (b) Describe the following features of an AS/RS:

- i. Fully/Empty bin detectors
  - ii. Load identification station
  - iii. Sizing stations
  - iv. Aisle transfer cars [8+8]
7. What is the objective of Adaptive Control with Constraints? Draw the block diagram of a typical computerized Adaptive Control with Constraints system for grinding process and explain in detail. [16]
8. (a) Explain the solid based Rapid Prototyping process with the help of neat sketch.  
(b) Explain the objectives of Concurrent Engineering. [8+8]

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