

Code No: **R42034****R10****Set No. 1**

IV B.Tech II Semester Regular/Supplementary Examinations, April- 2015
AUTOMATION IN MANUFACTURING
(Mechanical Engineering)

Time: 3 hours**Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

1. a) Discuss the following automation strategies:
i) Combined Operations ii) On-line inspection
iii) Plant Operation Control iv) Process Control and Optimization
b) Describe the function and working of the following automated machine tools:
i) Transfer Machine ii) Single Station machine
2. a) Illustrate the working of walking beam transfer system with the help of neat sketches.
b) Explain the differences between intermittent transfer mechanism and power-and-free transfer mechanism.
3. A proposal has been made to replace one of the current manual stations with an automatic work head on a 10-station transfer line. The current system has six automatic work heads and four manual stations. The current cycle time is 30 s. The bottleneck station is the manual station that is the candidate for replacement. The proposed automatic station would allow the cycle time to be reduced to 24 s. The new station costs at Rs.25/min. Other cost data for the existing line:
 $C_o = \text{Rs.15/min}$; $C_{as} = \text{Rs.10/min}$; $C_{at} = \text{Rs.10/min}$. Breakdowns occur at each of the six automatic workstations with a probability $p = 0.01$. The average downtime per breakdown is 3 min. It is estimated that the value of p for the new automatic station would be $p = 0.02$. The average downtime for the line would be unaffected. Material for the product costs Rs.50/unit. Tooling costs can be neglected ($C_t = 0$). Which is the best method among the new automated station and the current manual station based on the cost per unit?

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4. a) Explain the importance in solving line balancing problems by using Ranked Positional Weights Method.
b) Discuss the following ways for improving the performance of the line balance:
 - i). Dividing work elements
 - ii). Pre assembly of components
 - iii). Inventory Buffers between stations
5. a) Explain the applications of Automated Guided Vehicles.
b) What are the important categories of Automated Guided Vehicle Systems?
Discuss them briefly with the help of neat sketches
6. a) Describe the Aisle transfer cars of an AS/RS system.
b) What are the various operation parameters that can be measured in milling operation to use them in adaptive control systems.
7. a) Draw the block diagram of Adaptive Control with Optimization system for grinding operation and explain each block in detail.
b) Explain the variables in the Adaptive Control with Optimization system for drilling process.
8. a) Define accuracy, precision and sensitivity of an automated inspection system.
b) What are the basic functions of machine vision system?

Code No: **R42034****R10****Set No. 2****IV B.Tech II Semester Regular/Supplementary Examinations, April- 2015****AUTOMATION IN MANUFACTURING****(Mechanical Engineering)****Time: 3 hours****Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

1. a) Explain the following types of Automation:
i) Programmable Automation ii) Fixed Automation
b) Describe the function and working of the single station automated machine tool.
2. a) Illustrate the working of walking beam transfer system with the help of neat sketches.
b) Explain the use of buffer storage zones in automated flow lines.
3. a) Discuss the analysis of the performance of a partially automated flow line without buffer storage.
b) In a 10 station transfer line, the probability that a station break down will occur for a given work part is equal to 0.02. 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.
4. a) What are the various assembly systems used in industry to accomplish the assembly processes.
b) What are the various possible ways that should be considered by the designer for improving the operation of the line?
5. a) Explain the advantages of implementing various principles of material handling.
b) What are the important categories of Automated Guided Vehicle Systems?
Discuss them briefly with the help of neat sketches
6. a) What are the various operation parameters that can be measured in milling operation to use them in adaptive control systems.
b) Briefly describe the Pickup and deposit stations of an AS/RS.
7. a) Draw the block diagram of Adaptive Control with Optimization system for milling and explain each block in detail.
b) Explain the variables in the Adaptive Control with Optimization system for drilling process.
8. a) Explain the image processing and analysis in the operation of machine vision.
b) What are the advantages of non-contact inspection techniques?

Code No: **R42034****R10****Set No. 3****IV B.Tech II Semester Regular/Supplementary Examinations, April- 2015****AUTOMATION IN MANUFACTURING****(Mechanical Engineering)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions****All Questions carry equal marks**

1. a) Draw the general structure of a hydraulic circuit and explain the important components involved in it.
b) What are the important pneumatic components used in automated system? Describe briefly.
2. a) Draw the neat sketch of Rack and Pinion mechanism for rotary indexing table and explain its working.
b) Explain briefly cam mechanism for material transfer with the help of neat sketch.
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.
4. a) Discuss the Dividing work elements for improving the performance of the line balance.
b) Explain the steps used in solving the line balancing problem by using Largest Candidate Rule method.
5. a) Discuss the important factors to be considered in material handling system design.
b) Describe the following conveyors used in material transport systems:
i) In-floor tow-line conveyor ii) Overhead trolley conveyor.
6. a) Discuss how to overcome the problems that are encountered in interfacing AS/RS units to the manufacturing function.
b) "The work-in-process storage systems are a systematic method for managing work-in-process in batch production factories"-Explain the reasons.
7. a) List out the various operation parameters that can be measured in turning operation to use in adaptive control systems.
b) What are the applications of adaptive control system in various machining operations?
8. a) What are the various advantages of using CMM?
b) What are the advantages of non-contact inspection techniques?

Code No: **R42034****R10****Set No. 4****IV B.Tech II Semester Regular/Supplementary Examinations, April- 2015****AUTOMATION IN MANUFACTURING****(Mechanical Engineering)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions****All Questions carry equal marks**

1. a) What are the important pneumatic components used in automated system?
b) Discuss the common reasons for line stoppages in automated flow lines
2. a) Explain briefly cam mechanism for material transfer with the help of neat sketch
b) A Geneva mechanism with a six-slotted driven member is used in a dial-type assembly machine. The longest assembly operation takes exactly one second to complete, so the driven member must be in a stopped (dwell) position for this length of time.
 - i). At what rotation speed must the driver be turned to accomplish this one second dwell?
 - ii). How much time will be required to index the dial to the next position?
 - iii). Determine the ideal production rate of the assembly machine if each index of the dial produces a completed work part.
3. a) What is the Partial Automation used in automated flow lines?
b) An eight-station rotary indexing machine operates with an ideal cycle time of 45 s. The frequency of line stop occurrences is 0.08 stops/cycle on the average. When a stop occurs, it takes an average of 3 min to make repairs. Determine the following:
 - i) Average production time
 - ii) Average production rate
 - iii) Line efficiency
 - iv) Proportion of downtime
4. a) What are the different manual methods for solving the line balancing problems? Briefly discuss any one method.
b) Enumerate the differences between flexible assembly lines and manual assembly lines.
5. a) Describe the following Automated Guided Vehicle System with the help of simple sketch:
 - i) Driverless Automated Guided Train
 - ii) Unit Load Carrier.
b) Explain the applications of Automated Guided Vehicles
6. a) Explain the following components of an AS/RS:
 - i) Storage/Retrieval machine
 - ii) Storage modules.
b) Discuss the use of automated work-in-process storage systems
7. a) List out the differences between ACO and ACC types of adaptive control
b) List out the variable parameters that can be measured in grinding process to use in adaptive control system
8. a) Write the step by step inspection procedure to be performed.
b) What is image acquisition and digitization in the operation of machine vision?