

B.E. Eighth Semester (Mechanical Engineering) (C.B.S.)
Automation in Production

P. Pages : 3

Time : Three Hours



KNT/KW/16/7594

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) What is automation in production. Explain how product variety and production volume are related to various types of automation system. **6**
- b) A manual assembly line operator with a mechanized conveyors which moves at a speed of 2m/min. The spacing between the base part put on the line is 1.5m and stations are separated from each other by 2.5m. Find the ideal minimum number of work stations and cycle time. Get the line balancing solution using largest candidate rule and find the balance delay. **7**

Element	Time (Min)	Preceded by	Element	Time (Min)	preceded by
1	0.2	-	8	0.2	5
2	0.5	-	9	0.4	5
3	0.2	1	10	0.3	6,7
4	0.6	1	11	0.1	9
5	0.1	2	12	0.2	8,10
6	0.2	3,4	13	0.1	11
7	0.3	4	14	0.3	12,13

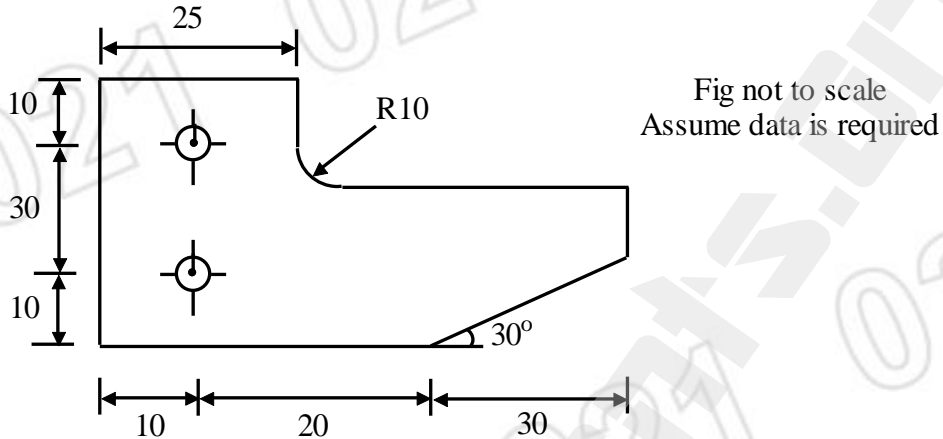
OR

2. a) What are the different methods of workpart transport for transfer line? Describe their suitability to different manufacturing situations. **6**
- b) An 8 station automatic assembly line has an ideal cycle time of 40 sec. the average downtime per occurrence is 4 min. The fraction defect rate is 1% and the probability that the defective part jam at a given station is 0.7 for all stations. The cost to operate the assembly machine is Rs. 800/- per hour and cost of components being assembled is Rs. 200/- per unit. Ignoring other cost Determine i) yield of good assemblies ii) Average rate of good assemblies. iii) What proportion of assemblies will have at least one defective component. iv) Determine unit cost of assembled product. **7**
3. a) What is Numerical control system? Explain various types of N.C motion control system. **6**

- b) Explain various components of NC system. Also discuss the problem with conventional NC that leads to the development of DNC and CNC. 7

OR

4. a) Explain various N.C Words and APT statements. 5
- b) Write an APT part programme for the component (drilling & milling). The spindle speed is 500 rpm. feed rate is 2 mm/rev. Thickness of the part = 20 mm. If two cuts are required (Finish cutter = 20 mm & Rough cutter = 28 mm) along with two holes of 6 mm diameter. 8



5. a) Explain 'sensors' in Robots with specific applications. 6
- b) With the help of neat sketches explain various robot configuration stating their advantages and application. 8

OR

6. Write short notes on **any three**. 14

- i) Robot Joints.
- ii) End effectors in Robot.
- iii) Adaptive control.
- iv) Robot programming.
- v) Robot work volume.

7. a) Explain various types of AGVS. Also discuss vehicle guidance and Routing for AGVS. 7
- b) The following specifications are given for AGVS which is capable of making 120 deliveries per hour. The Average Travel distance per delivery is 150 m. Average empty travel distance is 100 m. Load and unload time (each) is 0.75 min. speed of vehicle is 40m/min. The traffic factor is 0.80. Determine. 6
- i) Average total time per delivery, the handling system efficiency, and the resulting No. of deliveries per hour for a vehicle.
 - ii) No. of vehicles required for 120 deliveries/ hour.

OR

8. a) What is AS/RS. What are its types. Also Explain various elements of an AS/RS. 7
- b) A mechanised storage carousel has a length of 12 m and width of 1.5 m The velocity of the carousel is 20 m /min. and the part handling time at the unload station is 50 sec. Determine the average time to retrieve a part from the system. 6
- i) Assuming that the part revolves in single direction.
- ii) Assuming that it revolves in both directions.

9. a) Define Group Technology? Explain optiz classification and coding system with an example. 6
- b) Explain with neat sketches various configurations of Co-ordinate measuring machine. 7

OR

10. a) Compare offline and online Inspection. Also explain machine vision system with neat sketch. 7
- b) Explain composite part concept and production flow analysis (PFA). 6
11. a) What do you mean by computer Integrated Manufacturing system? Explain. 7
- b) What is F.M.S? Explain different layout configurations of FMS. 7

OR

12. Write short notes on **any three**. 14
- i) Flexibilities in FMS.
- ii) CAPP and its types.
- iii) Stop floor control.
- iv) C.A.Q.C.

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 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Discuss various strategies of automation. **6**
- b) In the operation of a certain 15-station transfer line, the ideal cycle time is 0.58 min Break down occur at a rate of once every 20 cycles and the average down time per breakdown is 9.2 min. **7**
The transfer line is located in a plant that works an 8 hr day, 5 days per week,
Determine
a) Line efficiency
b) How many parts will the transfer line produce in a week.

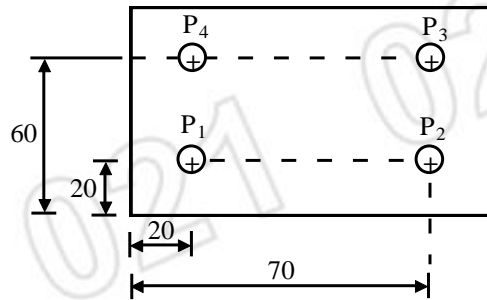
OR

2. a) Name some of the important performance measures of an automated assembly system. **3**
- b) List manual line balancing algorithms. (at least three) **3**
- c) An eight station assembly machine has an ideal cycle time of 6 sec. The fraction defect rate at each of the eight station is 0.015 and assume that defects never Jam the workstations. When a breakdown occurs it takes 1 min on an average to put system back into operation. Determine the production rate of the assembly machine, and the yield of good product and proportion uptime of the system. **7**
3. a) What is NC and DNC, explain. **6**
- b) What are advantages and disadvantages of implementing NC technology. **7**

OR

4. a) Discuss about tape formats used in NC. **6**

- b) Write the complete APT part program to perform drilling operations for the part drawing, shown below, cutting speed = 0.4 m/s feed = 0.1 mm/rev, and table travel speed between holes = 500mm/min post processor statement is MACHIN/DRILL, 04 Depth of plate is 10mm. 7



5. a) What is an end effector in robot and what are its type. 6
 b) Explain various robot configurations with their advantages. 8

OR

6. a) Write short notes on **any three**. 14
- a) Sensors in Robots
 - b) Robot programming
 - c) Robot Joints
 - d) Degree of freedom
 - e) Robot application

7. a) What is Automated storage and retrieval system (ASRS). Discuss with neat sketch. 6
 b) The length of the storage aisle in an AS/RS is 72 m and its height is 18 m. Suppose horizontal and vertical speeds are 120 m/min and 18 m/min respectively. S/R machine require 18 sec to accomplish a pickup and deposit operation. Find:- 8
- a) Single and dual command cycle time/aisle
 - b) Throughput for the aisle under the assumption that storage system utilization is 85% and number of single command and dual command cycles are equal.

OR

8. a) What is automated guided vehicle system (AGVS) and what is forward sensing in AGVS term. 8
 b) An automated guided vehicle system has an average travel distance per delivery of 200 m and an average empty travel distance of 150 m. Load and unload times are 24 sec each. The speed of AGV is 1m /sec. Assume traffic factor to be 0.9 and availability as 0.95 Find 6
- a) How many vehicles are needed to satisfy a delivery requirement of 30 del/hr.

9. a) Discuss distributed inspection and final inspection. 6
b) What is group technology and what are its benefit. 7

OR

10. a) Write a short note on "Machine Vision". 6
b) Classify Coordinate measuring machine" with neat sketches. 7
11. a) What are the basic components of flexible manufacturing system (FMS). Explain different FMS layouts. 7
b) Write a short note on computer integrated manufacturing (CIM) 6

OR

12. Write short notes on **any three** 13
- a) FMS benefits
 - b) CAPP
 - c) Manufacturing planning & control
 - d) CAPP benefits
 - e) Cellular manufacturing
