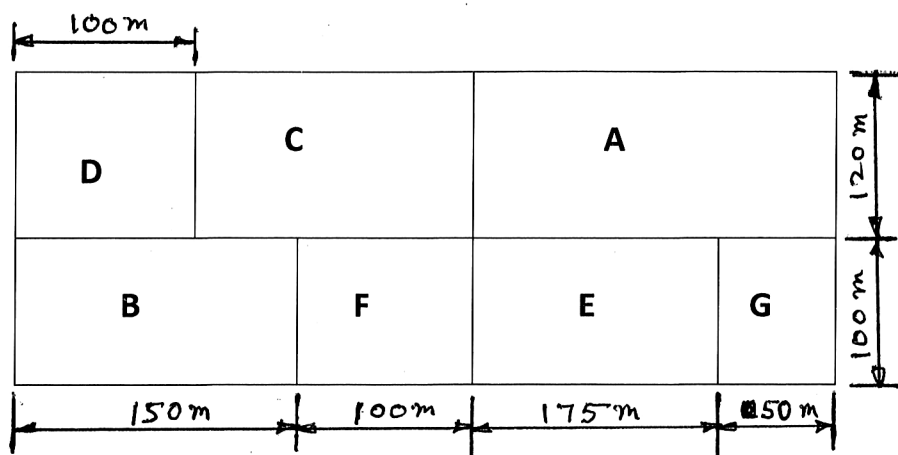


M.E. PRODUCTION ENGINEERING FIRST YEAR FIRST SEMESTER EXAMINATION – 2025**ADVANCED INSPECTION & MATERIAL HANDLING****Time: 3 hours****Full Marks: 100****Answer for at least 20 marks for each Group.****Group-A**

Q1. A) Identify the different product handling equipments that are used in advanced manufacturing systems? Classify the parameters that control the design of a product handling system in a manufacturing plant and explain their respective effects on system performance.

B) From the given production data and layout of a manufacturing plant evaluate the total product handling cost per month. Assume that 100 units are moved per trip and cost of handling is Rs.10 per meter of movement

Product No.	Processing Sequence	Monthly Production (Qty.)
11	A C D F E	800
12	D F G B	2000
23	E F A	1600
24	A C D G	1305
25	A B D G E	2500
34	A B C D E	800
47	D F E	1500
48	A C B	8050
69	D F E	2000
80	A G D	1500
91	C A D E G F	1080



10+10

[Turn over

M.E. PRODUCTION ENGINEERING FIRST YEAR FIRST SEMESTER EXAMINATION – 2025

ADVANCED INSPECTION & MATERIAL HANDLING

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Answer for at least 20 marks for each Group.

Group-A

Q2. A) Explain the advantages and limitations of automated product handling.

B) Briefly explain the different methods and mechanisms used for Work part transfer in Automated Flow Lines.

C) Explain with suitable examples how Robots are used in automated product handling systems.

5+9+6

Q3.A) Identify the equipments that are used for product quality evaluation in advanced manufacturing systems. Explain the advantages of automated inspection of products.

B) Differentiate between i) Contact & Non-contact measurement & ii) Online & Off-line Inspection.

C) Explain with suitable diagram how a machine vision system can effectively be used for measurement of product dimensions.

6+7+7

4. A) With the help of neat sketches explain the principle of measurement and operation of a Co-ordinate Measuring Machine (CMM). Explain the advantages of CMM over other measurement Equipments/Instruments.

B) With the help of suitable sketches explain the structure of a CMM and the functions of its different constituent units. Enlist the product features/quality parameters that can be evaluated by a CMM.

10+10

Group-B

1. Elaborately explain the types of conveyors used in industry. 10
2. A recirculating conveyor has a total length of 500 ft. Its speed is 100 ft/min and the spacing of the part carried along its length is 25 ft. Each carrier can hold two parts. Robots are used to load and unload the conveyor at its load and unload stations. The time required to load a part is 0.20 min and the unload time is the same. The required loading and unloading rates are both 1.0 part/min.
 - a) What is the maximum flow rate of parts on the conveyor system?
 - b) How many parts could be contained in the conveyor system if every carrier were filled to capacity?
 - c) How much time is required for the conveyor to make one complete loop?
 - d) Evaluate the conveyor system design with respect to the three principles developed by the Kwo. 10
3. Illustrate the application of automated guided vehicles according to operations and systems. 10
4. It is desired to determine how many vehicles will be required to satisfy demand for a particular AGVS. The system must be capable of making 40 deliveries/hour. The following specifies the system's performance characteristics.

Vehicle velocity = 150 ft/ min

Average distance travel per delivery = 450 ft.

Pick-up time = 45 seconds (0.70 min)

Drop-off time = 45 seconds (0.70 min)

Average distance traveling empty = 300 ft.

Traffic factor = 0.90

Determine the number of vehicles required to satisfy the delivery demand and also determine the handling system efficiency. 10

Signature of the Paper Setter

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Answer any four questions.

Group-B

5. What are the basic components of automated storage and retrieval systems? Also, describe some special features of automated storage and retrieval systems. (5+5=10)
6. Consider the operation of a unit load AS/RS that uses an S/R machine for each aisle of the system. The length of the aisle is 300ft. and its height is 50 ft. Horizontal and vertical travel speeds of the S/R machine are 400 ft/min and 75 ft/min, respectively. The S/R machine requires 30 seconds to accomplish a P&D operation. Determine the single-command and dual-command cycle time for the storage systems. 10