

Model Question Paper

Seventh Semester BE Degree Examination

Automation in Manufacturing

Time: 3 Hours (180 Minutes)

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.

Module -1				M	L	C			
Q1	a.	Explain the role of manufacturing support systems in a production system.	08	L2	CO1				
	b.	Describe the different types of production facilities used in manufacturing.	06	L2	CO1				
	c.	Explain the role of automation in production systems.	06	L2	CO1				
OR									
Q2	a.	Explain the principles and strategies of automation used in manufacturing.	08	L2	CO1				
	b.	Describe the role of manual labour in a production system.	06	L2	CO1				
	c.	Explain the relationship between product design, production systems and manufacturing costs.	06	L2	CO1				
Module- 2									
Q3	a.	Explain the basic elements of an automated manufacturing system.	08	L2	CO2				
	b.	Describe the different levels of automation in manufacturing.	06	L2	CO2				
	c.	Differentiate between continuous control and discrete control systems.	06	L2	CO2				
OR									
Q4	a.	Explain the different forms of computer process control used in manufacturing.	08	L2	CO2				
	b.	Explain the fundamental principles of NC and CNC technology.	06	L2	CO2				
	c.	Describe the applications of CNC systems in manufacturing.	06	L2	CO2				
Module – 3									
Q5	a.	A manufacturing company produces 5,000 identical components per month, with each component undergoing a fixed sequence of operations: cutting → drilling → turning → grinding → inspection. Suggest a suitable layout to ensure a smooth and continuous flow of production and justify your choice.	10	L3	CO3				
	b.	Describe the concept of Cellular Manufacturing and its role in improving material flow and reducing production time.	10	L2	CO3				
OR									
Q6	a.	A company produces a large quantity of identical components using a fixed sequence of operations. The company wants to automate production to increase productivity and reduce manual intervention. Suggest a suitable type of automation for this production system and justify your choice.	10	L3	CO3				
	b.	Illustrate the concept of part families and machine groups in Group Technology.	10	L2	CO3				
Module – 4									
Q7	a.	A manufacturing process is used to produce a component for which the surface roughness is to be minimized. The following surface roughness values (in μm) are obtained for three different process settings:	10	L3	CO4				
						Process Setting	Trial 1	Trial 2	Trial 3
						A	2.8	3.0	2.9
						B	2.2	2.4	2.3

		C	3.5	3.2	3.4																		
		Using the Taguchi Signal-to-Noise (S/N) ratio for the “smaller-the-better” characteristic, Calculate the S/N ratio for each process setting and identify the best process setting.																					
	c.	Explain the concept of Statistical Process Control (SPC) and its role in controlling process variations using control charts.				10	L2	CO4															
OR																							
Q8	a.	A Coordinate Measuring Machine (CMM) is used to measure the diameter of a circular hole. The coordinates of four points measured on the circumference are given below: <table><tr><td>Point</td><td>X (mm)</td><td>Y (mm)</td></tr><tr><td>P₁</td><td>25.02</td><td>40.01</td></tr><tr><td>P₂</td><td>55.00</td><td>40.03</td></tr><tr><td>P₃</td><td>55.02</td><td>70.00</td></tr><tr><td>P₄</td><td>24.98</td><td>69.99</td></tr></table> Calculate i) The approximate centre coordinates of the hole ii) The diameter of the hole using the average of the horizontal and vertical diameters. iii) If the specified diameter is 30.00 ± 0.05 mm, determine whether the measured hole is within the specification limits. iv) Percentage dimensional error with respect to the nominal diameter.				Point	X (mm)	Y (mm)	P ₁	25.02	40.01	P ₂	55.00	40.03	P ₃	55.02	70.00	P ₄	24.98	69.99	10	L3	CO4
	Point	X (mm)	Y (mm)																				
P ₁	25.02	40.01																					
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P ₃	55.02	70.00																					
P ₄	24.98	69.99																					
	c.	Explain the working principle of optical inspection techniques used in manufacturing.				10	L2	CO4															
Module – 5																							
Q9	a.	A manufacturing plant has 6 machines, each operating for 8 hours per day for 25 working days per month. The utilization of the machines is 80% and their efficiency is 90%. If each component requires 0.75 machine hours for processing, calculate i) The available monthly machine capacity. ii) The effective machine capacity. iii) The maximum number of components that can be produced per month.				10	L3	CO5															
	c.	Describe the concept of Computer Aided Process Planning (CAPP) and its role in developing a systematic sequence of manufacturing operations.				10	L2	CO5															
OR																							
Q10	a.	A production system consumes 480 components per day and operates for 8 hours per day. The replenishment lead time is 2 hours. Each Kanban container holds 20 components and a 10% safety factor is maintained. Calculate the number of Kanban containers required for the production system.				10	L3	CO5															
	c.	Illustrate the importance of Production Planning and Control (PPC) systems in manufacturing.				10	L2	CO5															
