Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2025

Subject Code:3171922 Date:14-05-2025

Subject Name:Automation in Manufacturing

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Define automated manufacturing system. Enlist various elements of the automated manufacturing system.	**03**
	(b)	Describe the various types of sensors used in automation. Suggest sensors used in smartphones.	**04**
	(c)	Explain automation migration strategies in three phases with a neat sketch.	**07**
Q.2	**(a)**	State the objective and applications of rank order clustering (ROC).	**03**
	(b)	What is meant by "Key machine" in cellular manufacturing? Justify your answer with a neat sketch.	**04**
	(c)	Explain the types of part classification and coding systems used in group technology (GT).	**07**
		OR	
	(c)	Explain ten strategies for automation and process improvement.	**07**
Q.3	**(a)**	What is meant by a flexible manufacturing system (FMS)? Enlist various elements of FMS.	**03**
	(b)	Explain the types of flexibilities in FMS. State the factors on which these flexibilities depend.	**04**
	(c)	What do you mean by quantitative analysis of FMS? Explain any one mathematical model of the same in brief.	**07**
		OR	
Q.3	**(a)**	Describe the ASRS system used in FMS.	**03**
	(b)	What is the importance of an automated material handling system?	**04**
	(c)	Enlist various types of rotary actuators and explain any two in brief.	**07**
Q.4	**(a)**	Write a short note on "Application of pneumatic and hydraulic systems in automation."	**03**
	(b)	Differentiate between online and offline programming of robots. Draw a neat sketch to support your answer.	**04**
	(c)	A restaurant with the brand "DCBA" pizza employs a transfer machine with 10 stations for making pizza topping, with an average production time of 1.10 minutes. When a line stop occurs due to sensor failure, the average downtime time is estimated as 6.5	**07**

minutes. Determine (a) the frequency of line stops (stops per cycle), (b) the average pizza production rate in pieces per hour, and (c) cycle time (d) pizza-carrying line efficiency assuming proportion downtime as 42%.

OR

Q.4 **(a)** Explain the role of CMM in computer-aided quality control. What are the different elements of CMM? **03**

(b) Illustrate various automated transfer lines that move work parts between stations with a neat sketch. **04**

(c) In a flexible manufacturing system at WXYZ company, it is planned to develop Automatic Guided Vehicles (AGVs) and Automatic Storage and Retrieval Systems (AS/RS). The company officials are also evaluating the number of AGVs required for the material handling demonstration of the spindle in the same company. The setup is expected to demonstrate delivery of 75 pieces of spindles per hour. The company officials agreed to lay a magnetic tape-guided path system with the unit load AGVs. The data available as per the demographic condition of the company are mentioned in the table below: **07**

Vehicle speed	4.02 kmph
Traffic factor	0.8
Average distance expected to be traveled with load /delivery	220 m
Average distance expected to be traveled without load /delivery	150 m
Pick-up time for spindle	0.0042 hrs.
Drop-off time for spindle	0.0043 hrs.

Q.5 **(a)** State the different attributes of a robot. **03**

(b) Differentiate between transducers and sensors? What do you mean by actuator? **04**

(c) Explain the function of following in the context of robots **07**

1) Manipulators 2) End effector 3) Shoulder 4) Gripper
5) Wrist 6) Elbow 7) Frame

OR

Q.5 **(a)** What is modular automation design? Enlist components of same for casting shop design. **03**

(b) Discuss the scope of automation in Indian industries. **04**

(c) Explain the effect of automation on the economy in the context of India. **07**

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