Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (R,S), MAY 2024

ROBOTICS AND AUTOMATION

(2021 Scheme)

Course Code: **21RA201**

Course Name: **Industrial Automation**

Max. Marks: **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. In relation to the "USA" principle, list the ten strategies of automation.
2. How can automated pallet changers improve the productivity in CNC machines?
3. List the three broad design considerations in material handling
4. What are the key characteristics of a Flexible Manufacturing System (FMS)?
5. Explain the various types of control strategies in industrial automation.
6. List the various unit operations in discrete manufacturing industries
7. What is Autonomation?
8. Write short notes on "just-in-time" production.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. List and explain the various types of flow lines in automation (6)

OR

10. With respect to the variety of products and quantity of products, compare the merits and demerits of

    (a) Fixed automation (6)

    (b) Programmable automation

MODULE II

11. What is the significance of spindle drives and feed drives in CNC machines? (6)

OR

12. Identify the type of tool changer given in the figure and prepare short notes on the same. (6)

MODULE III

13. Three forklift trucks are used to deliver pallet loads of parts between work cells in a factory. The average travel distance loaded is 350 ft and the travel distance empty is estimated to be the same. The trucks are driven at an average speed of 3 miles/hr when loaded and 4 miles/hr when empty. Terminal time per delivery averages 1.0 min (load = 0.5 min and unload = 0.5 min). If the traffic factor is assumed to be 0.90, availability = 100%, and worker efficiency = 0.95, what is the maximum hourly delivery rate of the three trucks? (6)

OR

14. With the help of a suitable example, write short notes on
    (a) From – to chart (6)
    (b) Network diagrams

MODULE IV

15. a What are manufacturing cells? (3)
    b Briefly explain the uniqueness of a manufacturing cell. (3)

OR

16. Within a week, an industry has to produce ten thousand parts. Based on the shape and dimensions of the hole, the parts are grouped into 50 categories. Each category is manufactured under exclusive machines and the lot size per category is 200 parts. The set-up time for each category requires 90 minutes. The average machine cycle time for each part is 20 minutes. Assuming the machine availability as 100% and (6)

each category has similar shape and dimensional requirements, estimate the following.

(a) The number of workstations required during a week (Assume 5 days per week, 1 shift per day, 8 hours per shift).

(b) The number of workstations required if two shifts are permitted per day (all other data remain the same)

MODULE V

17. With a neat block diagram, explain the basic concept of Distributed Control System (6)

OR

18. Briefly explain the various categories of Computer Process monitoring through data collection (6)

MODULE VI

19. List and explain the various types of automated assembly systems. (6)

OR

20. With a block diagram, explain the structure of Lean production system and prepare a few strategies to address the current issues in manufacturing industries. (6)

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