Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2022 - 23 Examination

Semester: 7 **Date: 06/10/2022**
Subject Code: 203109403 **Time: 10:30 am to 01:00 pm**
Subject Name: Automation in Manufacturing **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start a new question on new page.

Q.1 **A) Multiple Choice Questions** - **(15)**

1. Machine Vision is an approach used for:
a) Computer-Aided Process Planning b) Computer-Aided Inspection
c) Computer-Aided Quality Control d) Computer-Aided Design
2. MRP-1 refers to-
a) Material Resource Planning b) Material Requirement Planning
c) Manufacturing Requirement Planning d) Manufacturing Resource Planning
3. The advantage/s of automation is/are-
a) Lower initial costs b) Lower maintenance
c) High Productivity d) Improved empathy
4. Which of the following actuator is suitable for low-speed and high torque?
a) Hydraulic actuator b) Pneumatic actuator
c) Electric actuator d) None of the above
5. OPTIZ part coding is an example of:
a) mono-code b) poly-code
c) hybrid code d) none of the above

B) Fill in the blanks -

6. CMM stands for _____
7. An example of non-contact type of measurement technique is _____
8. An example of contact type of measurement technique is _____
9. DFM/A stands for _____
10. An example of a work transport system used in industries is _____

C) Very Short Questions -

11. What is line balancing?
12. Define Process Planning.
13. What is a storage buffer?
14. List components of FMS.
15. What is cellular manufacturing?

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Product X is made of two units of Y and three of Z. Y is made of one unit of A and two units of B. Z is made of two units of A and four units of C. Lead time for X is one week; Y, two weeks; Z, three weeks; A, two weeks; B, one week; and C, three weeks.
a) Draw the bill-of-materials (product structure tree).
b) If 100 units of X are needed in week 10, develop a planning schedule showing when each item should be ordered and in what quantity. Assume we have no inventory in any of the items to start.

B) What are the conditions where it is not feasible to automate the processes?

C) Explain any three reasons for including a storage buffer in an automated production line.

D) With reference to the automated assembly line, define the terms starving and blocking with suitable examples.

Q.3 A) There are three basic types of automation defined in the literature. Explain them with their features and advantages. **(07)**

B) A flexible manufacturing cell consists of two machining workstations plus a load/unload station. The load/unload station is station 1 with one server (human worker). Station 2 consists of one CNC machining center. Station 3 has one CNC drill press. The three stations are connected by a part-handling system that has one work carrier. The mean transport time is 2.0 min. The FMC produces three parts, A, B, and C. The part-mix fractions and process routings for the three parts are presented in the table below. The operation frequency is fijk = 1.0 for all operations. Determine **(08)**
(a) the maximum production rate of the FMC,

(b) the corresponding production rates of each product,
(c) the utilization of each machine in the system, and
(d) the number of busy servers at each station.

Part j	Part mix Pj	Operation k	Description	Station i	Process time tijk (min)
A	0.4	1	Load	1	4
		2	Mill	2	30
		3	Drill	3	10
		4	Unload	1	2
B	0.6	1	Load	1	4
		2	Mill	2	40
		3	Drill	3	15
		4	Unload	1	2

OR

B) What do you mean by Computer Aided Process Planning? Explain different approaches used in Computer Aided Process Planning. **(08)**

Q.4 A) The table below defines the precedence relationships and element times for a new model toy. **(07)**
(a) Construct the precedence diagram for this job.
(b) If the ideal cycle time = 1.1 min. repositioning time = 0.1 min, and uptime proportion is assumed to be 1.0, what is the theoretical minimum number of workstations required to minimize the balance delay under the assumption that there will be one worker per station?
(c) Use the largest candidate rule to assign work elements to stations.

Work Element	**T_e**	**Immediate Predecessors**
3	0.7	1
8	0.6	3,4
11	0.5	9,10
2	0.4	---
10	0.38	5,8
7	0.32	3
5	0.3	2
9	0.27	6,7,8
1	0.2	---
12	0.12	11
6	0.11	3
4	0.1	1,2

OR

A) Apply the rank-order clustering technique to the part-machine incidence matrix in the following table to identify logical part families and machine groups. Parts are identified by letters, and machines are identified numerically. **(07)**

	Parts								
Machines	A	B	C	D	E	F	G	H	I
1	1	1		1				1	
2					1				1
3			1		1				1
4		1		1		1			
5	1							1	
6			1						1
7		1				1	1		

B) With reference to Group Technology, define part family and machine cell. Also, explain the methods to form part families. **(08)**