Reg. No. | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Seventh Semester

ME18702 – COMPUTER INTEGRATED MANUFACTURING

(Mechanical Engineering)

(Regulation 2018)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 Students will be able to understand the concepts of CIM, automation and CAPP and select appropriate automation technology for a given manufacturing scenario.

CO 2 Students will be able to derive GT code for the given drawing using Opitz coding system and do quantitative analysis for the performance of cellular manufacturing.

CO 3 Students will be able to apply the concept of FMS and its applications and be able to solve simple quantitative analysis problems in FMS. Also understand AGVS, its applications and vehicle guidance management and safety.

CO 4 Students will be able to select an appropriate type of robot, end effector, and sensor for a given application.

CO 5 Students will be able to understand OSI, MAP, and TOP. Also, will be able to understand various data modelling and architecture of databases.

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	A company produces parts with a wide product variety. Which type of automation will you recommend?	**1**	**3**
2.	Why is an "Expert System" needed for Generative CAPP system?	**1**	**2**
3.	State the conditions suitable for GT.	**2**	**2**
4.	What are the various types of part movements that can be identified in a mixed-model part production system?	**2**	**2**
5.	How do you classify an FMS based on the number of machines?	**3**	**2**
6.	Justify why beacons are needed in Automated Guided Vehicle System (AGV).	**3**	**2**
7.	Draw accuracy and repeatability with a simple sketch.	**4**	**2**
8.	The spatial resolution of a jointed arm robot reduces when its arm is fully stretched. Justify.	**4**	**3**
9.	Justify the need for an open system.	**5**	**3**
10.	What are the three types of schemas?	**5**	**1**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	What is the need for CIM and what are its advantages?	**(7)**	**1**	**2**
	(ii)	Briefly discuss fixed automation, programmable automation, and flexible automation.	**(7)**	**1**	**2**
		(OR)			
(b)	**(i)**	Explain five levels of automation with simple diagram.	**(7)**	**1**	**2**

	(ii)	Write short notes on retrieval type CAPP system.	**(7)**	**1**	**2**
12. (a)	**(i)**	Elaborate the production flow analysis with an example.	**(7)**	**2**	**2**
	(ii)	Give an example for OPITZ parts classification and coding system.	**(7)**	**2**	**3**
		(OR)			
(b)	**(i)**	Explain the concept of part family with an example.	**(7)**	**2**	**2**
	(ii)	Five machines constitute a GT cell. The From/To data for the machines are shown in the table. (i) Determine the most logical sequence of machines for this cell (ii) Construct the network diagram for the data, showing where and how many parts enter and exit the system.	**(7)**	**2**	**3**

From	To				
	1	2	3	4	5
A	0	10	70	0	0
B	0	0	0	80	0
C	0	0	0	0	0
D	70	0	20	0	0
E	0	70	0	15	0

13. (a)		A flexible machining system consists of two machining workstations and a load/unload station. Station 1 is the load/unload station. Station 2 performs milling operations and consists of two servers (two identical CNC milling machines). Station 3 has one server that performs drilling (one CNC drill press). The stations are connected by a part handling system that has four work carriers. The mean transport time is 3.0 min. The FMS produces two parts A and B. The part mix fractions and process routings for the two parts are presented in the table below. The operation frequency f_{ijk}=1.0 for all operations. Determine: (a) Maximum production rate of the FMS (b) Corresponding production rates of each product (c) Utilization of each station (d) Number of busy servers at each station	**(14)**	**3**	**3**

Part j	Part Mix p_j	Operation k	Description	Station i	Process Time t_{ijk} (min)
A	0.3	1	Load	1	3
		2	Mill	2	40
		3	Drill	3	15
		4	Unload	1	2
B	0.7	1	Load	1	3
		2	Mill	2	50
		3	Drill	3	10
		4	Unload	1	2

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			Marks	CO	RBT LEVEL
		(OR)			
(b)	**(i)**	What is an Automated Guided Vehicle? Justify the need for an AGV in a manufacturing industry. Discuss automated guided vehicle system in detail.	**(7)**	**3**	**3**
	(ii)	Briefly discuss the traffic control, vehicle dispatching and vehicle safety of AGVs.	**(7)**	**3**	**2**
14. (a)	**(i)**	Explain the polar coordinate robot with a neat diagram. Give its advantages and disadvantages.	**(7)**	**4**	**2**
	(ii)	Explain the point-to-point and continuous path robot systems with neat diagram. Also give suitable applications for each of them.	**(7)**	**4**	**2**
		(OR)			
(b)	**(i)**	Write short notes on the various sensors used in robots.	**(7)**	**4**	**2**
	(ii)	List the various applications of an industrial robot.	**(7)**	**4**	**2**
15. (a)	**(i)**	Explain the Manufacturing Automation Protocol (MAP).	**(7)**	**5**	**2**
	(ii)	Explain the Technical Office Protocol (TOP).	**(7)**	**5**	**2**
		(OR)			
(b)	**(i)**	Explain the entity-relationship with a suitable diagram.	**(7)**	**5**	**2**
	(ii)	Explain the concept of relational database and give its advantages.	**(7)**	**5**	**2**

sPART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Apply the rank order clustering technique to the part-machine incidence matrix given in the table to arrange parts and machines into groups.	**(10)**	**2**	**3**

		Part Number				
Machine ID		P1	P2	P3	P4	P5
	M1			1		1
	M2		1	1		
	M3	1			1	
	M4		1	1		1
	M5	1			1	