MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

MUST KNOW CONCEPTS MKC

MECH **2020-21**

Course Code & Course Name : 16MED25 & Computer Integrated Manufacturing System

Year/Sem/Sec : **IV/VII /B**

S.No.	Term	Notation (Symbol)	Concept / Definition / Meaning / Units / Equation / Expression	Units
	Unit-I : Introduction			
1.	Computer Integrated Manufacturing	CIM	CAD/CAM functions + Business Functions	-
2.	CAD Functions		Designing using Computer Design = Modelling (Software: Autocad, Creo, Catia, Solidworks etc) + Analysis (Software: Ansys)	-
3.	CAM Functions		Use of computers for planning and control of manufacturing functions	-
4.	Forward Engineering		Model-Prototype - Product	-
5.	Reverse Engineering		Process of duplicating an existing component	-
6.	Rapid Prototyping	RPT	Adding and bonding materials in layers to form objects	-
7.	Concurrent Engineering		Involving internal customers in the design phase	-
8.	Manufacturing Planning		CAM is those in which computers are used indirectly to support the production function, but there is no direct connection between the computer and the process.	-
9.	Manufacturing Control		Manufacturing control is concerned with managing and controlling the physical operations in the factory.	-
10.	Examples for		• Process monitoring and control • Quality	

	manufacturing control		• Shop floor control • Inventory Control • Just – in time production system	
11.	Process monitoring and control		Better utilization of computer hardware and software to provide uninterrupted manufacturing process	
12.	Quality		Degree of Excellence	
13.	Manufacturing models		The manufacturer business model utilizes raw materials to create a product to sell. This type of business model might also involve the assembly of prefabricated components to make a new product, such as automobile manufacturing.	
14.	Mathematical models		Mathematical modeling is the art of translating problems from an application area into tractable mathematical formulations whose theoretical and numerical analysis provides insight, answers, and guidance useful for the originating application.	
15.	Metrics		The levels of branching are arbitrary and no precise metric is applied to distance between the nodes	
16.	Production Performance		This report summarizes data on daily and weekly quantities of different parts produced by the FMS. The reports compare the actual quantities against the production schedule	
17.	Manufacturing Planning and Control		Concerned with planning and controlling all aspects of manufacturing	
18.	Control Aspects in manufacturing		• Managing materials, • Scheduling machines • People, • Coordinating suppliers and • Key customers	
19.	Automation		Automation is a technology that is concerned with the use of mechanical electronic and computer based system in the operation and control of production.	
20.	Types of Automation		Fixed automation, programmable automation, flexible automation	

21.	Levels of Automation		• Device level • Machine level • Cell or system level • Plant level • Enterprise level	
22.	Marketing		The action or business of promoting and selling products or services, including market research and advertising	
23.	Sales		Sales are activities related to selling or the number of goods sold in a given targeted time period.	
24.	Accounting		Accounting is the process of recording financial transactions pertaining to a business	
25.	Research		The systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions	
Unit-II : Production Planning and Control and Computerized Process Planning				
26.	Process planning		Information and activities involved to transform raw materials into a finished product	
27.	Process Plan		Preparing Route sheet	
28.	Computer Aided Process Planning	CAPP	Preparation of Process Plan with the aid of Computer software	
29.	Automation		Process or procedure accomplished without human assistance.	
30.	Lean Manufacturing		Reducing waste in all forms.	
31.	Just in Time Inventory and Production system	JIT	Produces and delivers required number of items at required time	
32.	Continuous Process Production		Product flows continuously in the manufacturing system e.g. petroleum, cement, steel rolling, petrochemical and paper production etc	
33.	Mass Production		Production of large amounts of standardized products	
34.	Job Shop Production		Different items and different sequences among the production	

35.	Shop Floor Control	SFC	Collection of data to control production and inventory	
36.	Inventory control		Minimizing the investment and storage costs of holding inventory	
37.	CIM Hardware		It includes Manufacturing tools, Computer Hardware, Office equipments and Communication equipments.	
38.	Manufacturing Lead Time	MLT	Total time to process a given product	
39.	Break-even analysis		Analyzing of firm's sales, costs and operating profit at various levels.	
40.	Material requirements planning	MRP	Adequate schedule for the raw materials and parts used in the final products.	
41.	Master Production Schedule	MPS	listing of each end items to be manufactured , and their delivery details	
42.	Capacity requirements planning	CRP	Labour and equipment capacities needed to meet the production	
43.	Factory Data Collection	FDC	Terminals, and automated devices throughout the plant for collecting data	
44.	Manufacturing Resource Planning	MRP - II	Computer-based system for planning scheduling and controlling the materials, resources, and supporting activities	
45.	Enterprise Resource Planning	ERP	System of integrated applications to manage the business and automate office functions	
46.	Data collected by the FDC system		• Number of products (piece counts) completed at a certain machine. • Number of parts scrapped (or) Number of parts reworked. • Equipment breakdown.	
47.	Data		The quantities, characters, or symbols on which operations are performed by a computer, which may be stored and transmitted in the form of electrical signals and recorded on magnetic, optical, or mechanical recording media.	
48.	Route Sheet		A route sheet is a document which lists the exact sequence of operations needed to complete the job.	
49.	Types of CAPP		• Retrieval CAPP system • Generative CAPP System	

50.	CAPP Programming Software		• LISP • PROLOG	
Unit-III : Cellular Manufacturing				
51.	Group Technology	GT	Grouping a variety of parts having similarities of shape, dimension, and/or process route.	
52.	Part Family		Collection of parts similar in shape and size or and having same process	
53.	Cellular Manufacturing		Dissimilar machines have been arranged into cells for producing part family.	
54.	Process layout suited for which production type		Batch production	
55.	Process layout		In this layout manufacturing is done according to machine arrangement	
56.	Types of coding system		• OPITZ coding system • KK3 system • The MICLASS system	
57.	Ways to Identify Part Families		• Visual inspection • Production flow analysis • Parts classification and coding	
58.	Visual inspection		Using best judgment to group parts into appropriate families, based on the parts or photos of the parts	
59.	Production flow analysis		Using information contained on route sheets to classify parts	
60.	Parts classification and coding		identifying similarities and differences among parts and relating them by means of a coding scheme	
61.	Part Design Attributes		• Major dimensions • Basic external shape • Basic internal shape • Length/diameter ratio • Material type • Part function • Tolerances • Surface finish	
62.	Part Manufacturing Attributes		• Major process • Operation sequence • Batch size • Annual production • Machine tools • Cutting tools	

			• Material type	
63.	Composite Part		A composite part for a given family is a hypothetical part that includes all of the design and manufacturing attributes of the family	
64.	Benefits of Group Technology		• Standardization of tooling, fixtures, and setups is encouraged • Material handling is reduced • Parts are moved within a machine cell rather than entire factory • Process planning and production scheduling are simplified • Work-in-process and manufacturing lead time are reduced • Improved worker satisfaction in a GT cell • Higher quality work	
65.	FMS Components		• Workstations - CNC machines in a machining type system • Material handling system - means by which parts are moved between stations • Central control computer - to coordinate the activities of the components so as to achieve a smooth overall operation of the system • Software and control functions • Human labor	
66.	Types of FMS Layouts		• In-line • Loop • Ladder • Open field • Robot-centered cell	
67.	FMS Applications		• Machining –most common application of FMS technology • Assembly • Inspection • Sheet metal processing (punching, shearing, bending, and forming) • Forging	
68.	FMS Benefits		• Higher machine utilization than a conventional machine shop due to better work handling, off-line setups, and improved scheduling • Reduced work-in-process due to continuous production rather than batch production • Lower manufacturing lead times • Greater flexibility in production scheduling	

69.	Setup times		The time taken to prepare the manufacturing processes and system for production	
70.	Product or Line Layout		If all the processing equipment and machines are arranged according to the sequence of operations of the product, the layout is called product type of layout.	
71.	Rank Order Clustering		Rank Order Clustering is an algorithm characterized by the following steps: For each row i compute the number. Order rows according to descending numbers previously computed. For each column p compute the number.	
72.	Hollier Method		Use the "From-To" chart from part routing data to arrange the machines	
73.	Design retrieval		A designer faced with the task of developing a new part can use a design retrieval system to determine if a similar part already exists. A simple change in an existing part would take much less time than designing a whole new part from scrap	
74.	Automated process planning		The part code for a new part can be used to search for process plans for existing parts with identical or similar codes	
75.	Machine cell design		The part codes can be used to design machine cells capable of producing all members of a particular part family, using the composite part concept	
Unit-IV : Flexible Manufacturing System (FMS) And Automated Guided Vehicle System				
76.	Flexible Manufacturing System	FMS	Group of workstations connected by material handling and storage system and controlled by a computer	
77.	Dedicated FMS		Produce a limited variety of part in more number	
78.	Random-order FMS		Production schedule is changing day-to-day	
79.	Material Handling System		Movement, protection, storage and control of materials and products throughout manufacturing	
80.	Automated Guided	AGV	Computer controlled driverless vehicles	

	Vehicle		used for transporting materials	
81.	Vehicle Guidance Technology		Keeping AGV on a predefined path	
82.	Vehicle Management		Coordinating the unmanned vehicles	
83.	Vehicle Traffic Control		Minimizing interference between vehicles to prevent collusions.	
84.	Vehicle Dispatching		Assigning vehicle in time	
85.	Gantry Robot		Cartesian coordinate robots with the horizontal member supported at both ends are sometimes called Gantry robots.	
86.	Rail Guided Vehicles	RGV	Motorised vehicles that are guided by a fixed rail system constitute a third category of material transport systems.	
87.	Robot purchase cost		The basic price of the robot equipped from the manufacturer with the proper options (excluding end effector) to perform the application.	
88.	Engineering costs		The costs of planning and design by the user company‘s engineering staff to install the robot.	
89.	Installation costs		This includes the labor and materials needed to prepare the installation site (provision for utilities, floor preparation, etc.).	
90.	Special tooling		This includes the cost of the end eflector, parts position and other fixtures and tools required to operate the work cell.	
91.	Miscellaneous costs		This covers the additional investment costs not included by any of the above categories (e.g., other equipment needed for the cell).	
92.	Direct labor cost		The direct labor cost associated with the operation of the robot cell. Fringe benefits are usually included in the calculation of direct labor rate, but other overhead costs are excluded.	

93.	Indirect labor cost		The indirect labor costs that can be directly allocated to thc operation of the robot cell. These costs include supervision, setup, programming	
94.	Maintenance cost		This covers the anticipated costs of maintenance and repair for the robot cell.	
95.	Applications of AGV		• Driverless train operations • Storage distribution system • Assembly line operation • FMS	
96.	Types of AGV vehicles.		• Towing vehicles • Unit load vehicles • Pallet trucks • Fork trucks • Light load Vehicles • Assembly line vehicles.	
97.	Types of maintenance		• Preventive maintenance • Emergency maintenance	
98.	Preventive maintenance		It involves the planned servicing at periodic intervals	
99.	Mean Time To Repair	MTTR	measure the average time of repairing the robot for each breakdown	
100.	Mean Time Between Failures	MTBF	average time of machinery will operate between breakdowns.	
Unit-V : Industrial Robotics				
101.	Industrial Robot		Reprogrammable, multifunctional mechanical device performing tasks.	
102.	Manipulator		Machine having same function as of human being	
103.	End-effector		Attachments at the wrist arm perform a task.	
104.	Grippers		Device to grasp objects	
105.	Sensors		Device that detects information about the surroundings	
106.	Accuracy		Defined target point within work volume.	
107.	Precision		Closeness to the true value	
108.	Repeatability		Ability of the robot to position itself again and again	

109.	Spatial Resolution		Control resolution combined with mechanical inaccuracy	
110.	Control Resolution		capability of the robot's positioning system to divide the range of the joint into closed spaced points	
111.	Robot Program		List of instruction to support the robot work cycle	
112.	Work envelope		Space within the robot manipulates its wrist	
113.	Pitch		Up and down movement of wrist	
114.	Roll		Rotation of wrist	
115.	Yaw		Right and Left movement of wrist	
116.	Actuator		Devices used to convert hydraulic energy to Mechanical Energy	
117.	Pneumatic Actuator		Uses the power of air for actuation	
118.	Types of Magnetic Grippers		1. Permanent 2. Electromagnet	
119.	Machine Vision		Image processing and Image analysis techniques	
120.	Frame Grabber		Device to store the digital image	
121.	Kinematics		Study of relative motion between parts	
122.	Forward Kinematics		Determination of position and orientation knowing the joint angles	
123.	Reverse Kinematics		Determination of joint knowing the angles position and orientation	
124.	Teach Pendant		A small hand held control box to regulate robot movements	
125.	Automated Guided Vehicle	AGV	Computer controlled driverless vehicles used for transporting materials	
Placement Questions				
126.	How many times are the hands of a clock at right angle in a day?		A. 22 B. 24 **C. 44**	

			D. 48 Explanation: In 12 hours, they are at right angles 22 times. ∴ In 24 hours, they are at right angles 44 times.	
127.	A train moves with a speed of 108 kmph. Its speed in metres per second is :		A.10.8 B.18 **C.30** D.38.8 Explanation:108 kmph = 108*[5/18] m/sec = 30 m/s.	
128.	Determine the probability that a digit chosen at random from the digits 1, 2, 3, …12 will be odd.		Total no. of Digits = 12. Equally likely cases = 12. There are six odd digits. Probability = 6 / 12 = 1 / 2	
129.	In covering a distance of 40 km, Kamlesh takes 2 hours more than Pankaj. If Kamlesh doubles his speed, then he would take 1 hour less than Pankaj. Then what is Kamlesh's speed?		A. 11 kmph **B. 5 kmph** C. 9 kmph D. 6 kmph Answer:B Explanation: Let Kamlesh's speed be x km/hr. Then, `40/x - 40/(2x) = 4` 8x = 40 x = 5 km/hr	
130.	Solve the equation x+34=82		A. 58 **B. 48** C. 55 D. 60 Explanation: x=82-34=48	
131.	An accurate clock shows 8 o'clock in the morning. Through how may degrees will the		A.360. **B.180**	

	hour hand rotate when the clock shows 2 o'clock in the afternoon?		C.90 D.60 Answer: B) 180 Explanation: Angle traced by the hour hand in 6 hours=(360/12)*6	
132.	Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?		A. 9 **B. 10** C. 12 D. 20 Explanation: Due to stoppages, it covers 9 km less. Time taken to cover 9 km = $\frac{9}{54} \times 60$ min = 10 min.	
133.	Find the no., when 15 is subtracted from 7 times the no., the result is 10 more than twice of the number		Let the number be x. 7x -15 = 2x + 10 => 5x = 25 => x = 5	
134.	If 0.75: x :: 5:8, then x is equal to:		A.1.12 B.1.16 **C.1.20** D.1.30 Explanation:(x * 5) = (0.75 *8) X=6/5 = 1.20	
135.	Today is Monday. After 61 days, it will be :		A. Tuesday B. Monday C. Sunday **D. Saturday** Answer: D) Saturday Explanation: Each day of the week is repeated after 7 days. So, after 63 days, it will be Monday.	

			After 61 days, it will be Saturday.	
136.	Adam can do a job in 15 days; Eve can do the same job in 20 days. If they work together for 4 days, what fraction of job is incomplete?		Adam can do 1/15 of the job per day Eve can do 1/20 of the job per day If they work together they can do 7/60 of the work together Remaining job 1 - 7/60 = 32/60 = 8/15	
137.	Which one of the following is not a prime number?		A.31 B. 61 C. 71 **D. 91** Explanation: 91 is divisible by 7. So, it is not a prime number.	
138.	Find c, if 5c - 2 = 33		**A. 7** B. 9 C. 11 D. 13 Explanation: We add 2 to both sides and get 5c-2+2=33+2, or 5c=35. We divide both sides by 5 to get c=7.	
139.	A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?		A. 3.6 **B. 7.2** C. 8.4 D. 10 Explanation: Speed = 600/ 5 x 60 m/sec. = 2 m/sec. = 2 x 18/5km/hr =7.2 km/hr	
140.	A and B can do a piece of work in 4 days, while C and D can do the same work in 12 days.		A, B, C and D will together take ¼ + 1/12 = 4/12 = 1/3.	

	In how many days will A, B, C and D do it together?		3 days to complete the work.	
141.	The average of five numbers is 27. If one number is excluded, the average becomes 25. The excluded number is?		A.25 **B.35** C.45 D.55 Answer:B Explanation: (27*5)-(25*4) 135-100 35	
142.	The maximum gap between two successive leap year is?		A.4 **B.8** C.2 D.1 Answer: B) 8 Explanation: This can be illustrated with an example. Ex: 1896 is a leap year. The next leap year comes in 1904 (1900 is not a leap year).	
143.	A guy bought 10 pencils for Rs. 50 and sold them for Rs. 60.What is his gain in terms of percentage?		A. 10% B. 5% **C. 20%** D. 12% Answer:C Explanation: `"Gain%"=("Gain"/"C.P")*100=20%`	
144.	Two trains starting at the same time from 2 stations 200 km apart and going in opposite direction cross each other at a distance of 110 km from one of the stations. What is the ratio of their speeds?		In the same time, they cover 110 km and 90 km respectively. For the same time, speed and distance is inversely proportional. So ratio of their speed = 110:90 = 11: 9	
145.	In 100 m race, A covers the distance in 36		**A. 20m**	

	seconds and B in 45 seconds. In this race A beats B by:		B. 25m C. 22.5m D. 9m Explanation: Distance covered by B in 9 sec. = (100/45)*9m = 20m	
146.	Half percent, written as a decimal, is		A.0.2 B.0.02 **C.0.005** D.0.05 Answer: C Explanation: As we know, 1% = 1/100 Hence, (1/2)% = (1/2 * 1/100) = 1/200 = 0.005	
147.	A pump can fill a tank with water in 2 hours. Because of a leak, it took 2.5 hours to fill the tank. The leak can drain all the water of the tank in:		A. 4 1/3 Hours B. 7 Hours C. 8 Hours **D. 10 Hours** Explanation: Work done by the leak in 1 hour = $\left(\frac{1}{2}-\frac{2}{5}\right)=\frac{1}{10}$. ∴ Leak will empty the tank in 10 hrs.	
148.	If a number is chosen at random from 1 to 100, then the probability that the chosen number is a perfect cube is		We have 1,8,27 and 64 as perfect cubes from 1 to 100. Thus, the probability of picking a perfect cube is 4/100 = 1/25	
149.	Three times the first of three consecutive odd integers is 3 more than twice the third. The third integer is:		A. 9 B. 11 C. 13 **D. 15**	

			Explanation: Let the three integers be x, $x + 2$ and $x + 4$. Then, $3x = 2(x + 4) + 3 \Leftrightarrow x = 11$. $\therefore$ Third integer = $x + 4 = 15$.	
150.	Find the number, when 15 is subtracted from 7 times the number, the result is 10 more than twice of the number		**A. 5** B. 15 C. 7.5 D. 4 Explanation: Let the number be x. 7x -15 = 2x + 10 => 5x = 25 => x = 5	

Faculty Team Prepared **Signatures**

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