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

Question Paper Code : 91854

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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Seventh/Eighth Semester
Mechanical Engineering
ME 6703 – COMPUTER INTEGRATED MANUFACTURING SYSTEMS
(Common to Mechanical and Automation Engineering/Robotics and Automation Engineering)
(Regulations 2013)
(Also Common to PTME 6703 Computer Integrated Manufacturing Systems for B.E. (Part-Time) – Seventh Semester – Mechanical Engineering Regulations 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Name the two components of Production systems.
2. How can plant capacity be increased or decreased in the short term ?
3. Name some of the benefits derived from computer aided process planning.
4. Give the differences between the aggregate production plan and the master production Schedule.
5. Define the key machine concept in cellular manufacturing.
6. What are the typical objectives when implementing cellular manufacturing ?
7. What do you understand by the term volume flexibility ?
8. Distinguish the features of laser-guided vehicles from conventional AGVs.
9. What is meant by work volume in robotics ?
10. What are the general characteristics of industrial work situations that tend to promote the substitution of robots for human workers ?

PART – B (5×13=65 Marks)

11. a) There are ten machines in the automatic lathe section of a certain machine shop. The setup time on an automatic lathe averages 5 hours. Average batch size for parts processed through the section is 100. Average operation time = 9.0 minutes. Under shop rules, an operator can be assigned to run one or two machines. Accordingly, there are five operators in the section for the ten lathes. In addition to the lathe operators, there are two setup workers who perform only machine setups. These setup workers are busy the full shift. The section runs one 8-hour shift per day, 5 days per week. Scrap losses are negligible and availability = 100%. The production control manager claims that the capacity of the section should be 2000 parts per week. However, the actual output averages only 1600 units per week. What is the problem and recommend a solution ?

(OR)

b) Justify the seven forms of waste in manufacturing with examples.

12. a) Using the master schedule of Figure 1 and the product structures for P_1 and P_2 in figures 2 and 3. Determine the time-phased requirements for component C6 and raw material M6. The assembly lead time is 1 week for P_1, P_2, S_2 and S_3. For S_3 inventory on hand is 2 units and quantity on order is zero. For C6, inventory on hand is 5 units and quantity on order is 10 for delivery in week 2 and for M6, inventory on hand is 10 units and quantity on order is 50 for delivery in week 2.

	WEEK									
Product Line Model	1	2	3	4	5	6	7	8	9	10
Model P_1								50		100
Model P_2							70	80	25	

Figure : 1. Master Production Schedule

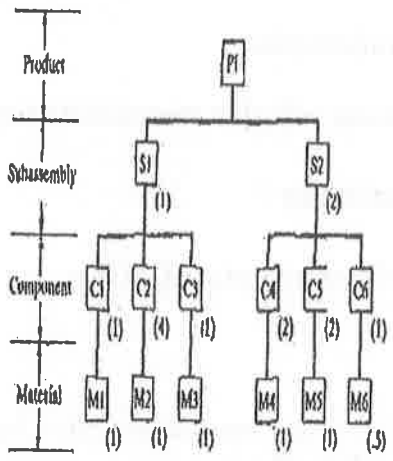

Figure : 2. Product Structure P1

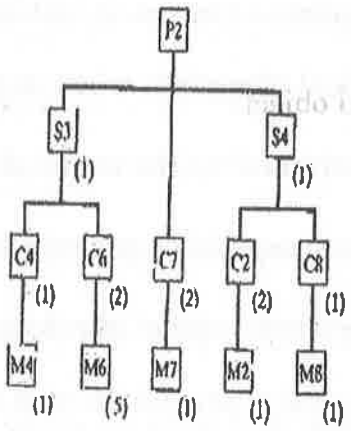

Figure : 3. Product Structure P2

(OR)

b) Discuss the following phases with respect to shop floor control.
   i) Order release. (5)
   ii) Order Scheduling. (8)

13. a) The following Table 1 lists the weekly quantities and routings of ten parts that are being considered for cellular manufacturing in a machine shop. Parts are identified by letters and machines are identified numerically. For the data given, (a) develop the part-machine incidence matrix and (b) apply the rank order clustering technique to the part-machine incidence matrix to identify logical part families and machine groups. **(3+10)**

Table : 1

Part	Weekly Quantity	Machine Routing
A	50	$3 \rightarrow 2 \rightarrow 7$
B	20	$6 \rightarrow 1$
C	75	$6 \rightarrow 5$
D	10	$6 \rightarrow 5 \rightarrow 1$
E	12	$3 \rightarrow 2 \rightarrow 7 \rightarrow 4$
F	60	$5 \rightarrow 1$
G	5	$3 \rightarrow 2 \rightarrow 4$
H	100	$3 \rightarrow 2 \rightarrow 4 \rightarrow 7$
I	40	$2 \rightarrow 4 \rightarrow 7$
J	15	$5 \rightarrow 6 \rightarrow 1$

(OR)

b) Five machines used to produce a family of parts are to be arranged into a GT cell. The from-to data for the parts processed by the machines are shown in the table below. (a) Determine the most logical sequence of machines for this data (b) Construct the network diagram for the data, showing where and how many parts enter and exit the system. (c) Compute the percentages of in-sequence moves, bypassing moves and backtracking moves in the solution. (d) Develop a feasible layout plan for the cell. **(4+3+3+3)**

Table : 2

	To				
From	1	2	3	4	5
1	0	10	80	0	0
2	0	0	0	85	0
3	0	0	0	0	0
4	70	0	20	0	0
5	0	75	0	20	0

14. a) Write an engineering brief on the following :
    i) Dedicated FMS and Random order FMS. **(7)**
    ii) FMS Operational issues. **(6)**

(OR)

b) In context of the AGVs describe the following :
    i) Self guided vehicle. **(7)**
    ii) Traffic control. **(6)**

15. a) Discuss the Common Robot Configurations in detail with the configuration diagram.

(OR)

b) Discuss the robot control systems in detail with the neat sketches.

PART – C **(1×15=15 Marks)**

16. a) Analyze the design features of the components part concept and the production steps required to design those features.

(OR)

b) Analyze the use of Flexible machining system for the mechanical processes with a case study.