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15ME62

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Discuss types of Automation relative to Production quantity and Product variety. **(08 Marks)**

b. Discuss Markov Chain Analysis for a two-stage automated production line under several down time distribution. **(08 Marks)**

OR

2 a. Explain the following :
(i) Production capacity (ii) Utilization and Availability
(iii) Manufacturing lead time (iv) Work in Progress. **(08 Marks)**

b. Explain the operation of walking beam transfer system. **(08 Marks)**

Module-2

3 a. Explain the role of computers in Design Process. **(08 Marks)**

b. A square with an edge length of 10 units is located on the origin. With one of the edge at an angle of 30° with the x-axis. Calculate the new position of the square if it is rotated about z-axis by an angle 30° in the clockwise direction. **(08 Marks)**

OR

4 a. Discuss retrieval-type process planning system. **(08 Marks)**

b. With a block diagram, explain the inputs to MRP. **(08 Marks)**

Module-3

5 a. With a sketch, explain FMS layout configurations. **(10 Marks)**

b. Explain the functions performed by FMS computer system. **(06 Marks)**

OR

6 a. Explain the types of AS/RS. **(10 Marks)**

b. Explain minimum rational Work Elements and Precedence constraints. **(06 Marks)**

Module-4

7 a. Explain the basic components of NC system. **(08 Marks)**

b. Write the manual part programming for the milling components shown in Fig.Q7(b) consider spindle speed as 800 rpm and feed rate as 100 mm/min and absolute positioning. Assume plate thickness as 10 mm and all dimensions are in mm.

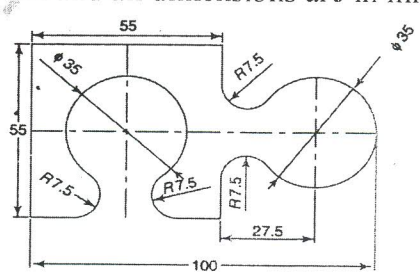

Fig.Q7(b) **(08 Marks)**

OR

8 a. Discuss various methods used to programme robots to perform a given work cycle. **(08 Marks)**

b. Discuss various application areas for industrial robots. **(08 Marks)**

Module-5

9 a. With a neat sketch, explain photo polymerization process in additive manufacturing. **(08 Marks)**

b. Discuss IOT applications in manufacturing. **(04 Marks)**

c. Define Big data and Cloud computing. **(04 Marks)**

OR

10 a. With a neat sketch, explain Sheet Lamination Process in additive manufacturing. **(08 Marks)**

b. Explain Industry 4.0 application in Manufacturing. **(08 Marks)**

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15ME62

Sixth Semester B.E. Degree Examination, June/July 2019
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define automation. Explain different types of automation. **(08 Marks)**

b. Explain the product life cycle mathematical models. **(08 Marks)**

OR

2 a. What is buffer storage? What are the reasons for implementing buffer storage in an automated production line? **(04 Marks)**

b. Explain Upper bound approach in analysis of flow line without storage buffer. **(03 Marks)**

c. A 20 station transfer line has two stages of 10 stations each. The ideal cycle time of each stage is 1.2 min. all the stations in the line have the same probabilities of stopping, p = 0.005. Assume that the downtime 8 min is constant when a breakdown occurs. Using upper bound approach, compute the line efficiency for the buffer stage capacities of (i) b = 0 (ii) b = ∞ (iii) b = 10 (iv) b = 100. **(09 Marks)**

Module-2

3 a. Explain the design process using computer aided design with a neat block diagram. **(09 Marks)**

b. Explain scaling in geometric models transformations. **(07 Marks)**

OR

4 a. Explain generative type process planning system and list the advantages of CAPP. **(08 Marks)**

b. Write a note on Material Requirement Planning and shop floor control. **(08 Marks)**

Module-3

5 a. Explain Flexible Manufacturing Cell with a sketch. **(06 Marks)**

b. State and explain the components of Flexible Manufacturing System. **(10 Marks)**

OR

6 a. Briefly explain the following: i) Minimum rational work element ii) Precedence diagram iii) Cycle time **(06 Marks)**

b. In a plant a product is to be assembled as per the following information: **(10 Marks)**

Elements	Time (Te) min	Immediate Predecessor
1	5	-
2	3	1
3	8	1
4	2	2
5	1	2
6	6	3
7	4	4, 5
8	5	3, 5
9	3	7, 8
10	6	6, 9

i) Construct the precedence diagram.

ii) If the cycle time is 10 min. what is the number of stations required?

iii) Compute the balance delay of the line by using Largest Candidate Rule method.

Module-4

7 a. What do you mean by cutter radius compensation in CNC programming? Briefly explain. **(02 Marks)**

b. Write different M-codes used in programming and their functions. **(04 Marks)**

c. Write a turning centre part program for the part shown in Fig.Q7(c). Use one finish cut and rest rough cut to remove the material. Use the following information.

Operation	Tool No.	Onset Register	Cutting speed (m/min)	Feed (mm/rev)
Rough cut	T01	10	200	0.4
Finishing	T02	12	300	0.2

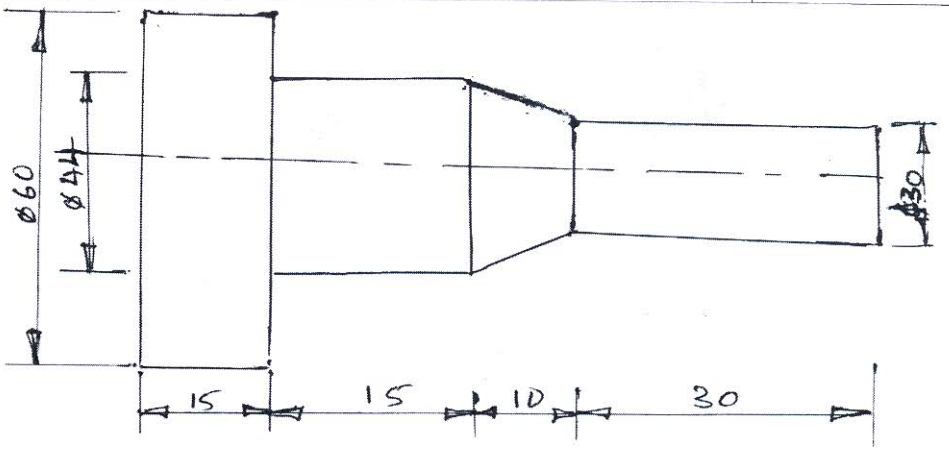

Fig.Q7(c) **(10 Marks)**

OR

8 a. Sketch and explain common robot configurations. **(10 Marks)**

b. Mention the different types of grippers. **(02 Marks)**

c. Explain lead through method of robot programming. **(04 Marks)**

Module-5

9 a. What is additive manufacturing? Explain the basic principles involved in additive manufacturing. **(10 Marks)**

b. List the advantages of additive manufacturing. **(06 Marks)**

OR

10 a. Write a note on Internet of Things. **(08 Marks)**

b. How these AM processes are carried out:

i) Binder Jetting

ii) Direct energy Deposition

iii) Material Jetting

iv) Hybrid Manufacturing **(08 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define Automation. Highlight features of different automation types with examples. **(10 Marks)**

b. A certain part is routed through 6 machines in a batch production plant. The setup and operation times are given in the table below. The batch size is 100 units and the average non – operation time per machine is 12 hours.

Machines	1	2	3	4	5	6
Setup time (hrs)	4	2	8	3	3	4
Operation time (min)	5	3.5	10	1.9	4.1	2.5

Determine: i) Manufacturing Lead time ii) Production rates for operation 3 and 5. **(10 Marks)**

2 a. List and explain in detail different types of automated flow configurations. **(10 Marks)**

b. Explain with neat sketch, rack and pinion mechanism. **(05 Marks)**

c. A rotary worktable is driven by a Geneva mechanism with six slots. The driver rotates at 30 rev/min. Determine the cycle time, available process time and the lost time each cycle indexing the table. **(05 Marks)**

3 a. The ideal cycle time of an 20 station transfer line is 1.2 min. The probability of station breakdown per cycle is equal for all stations and P = 0.005 break downs/cycle. For each of the upper – bound and lower – bound approaches, determine
i) frequency of line stops per cycle ii) average actual production rate
iii) line efficiency. **(10 Marks)**

b. A fifteen station transfer line is divided into two stages of 7 and 8 stations in each stage. The ideal cycle time for each stage is 1.2 min and the constant downtime is 4 min. Determine the line efficiency of the transfer line for the following storage buffer capacities, using upper bound approach. i) $b = 0$; ii) $b = \infty$.
All of the stations in line have same probability of stopping p = 0.02. **(10 Marks)**

4 a. Briefly explain the following terminologies used in Line Balancing.
i) Minimum Rational work Element ii) Precedence diagram iii) Cycle time
iv) Balance delay. **(08 Marks)**

b. The table below shows the precedence relationships and element times for a new part. The ideal cycle time is 10 seconds. Construct the precedence diagram. Using Kilbridge and Wester's method, compute the balance delay and line efficiency. **(12 Marks)**

Element number	1	2	3	4	5	6	7	8	9	10	11	12
Predecessor element	-	1	2	1	4	3, 5	6	7	6	6	10	8, 9, 11
Time (seconds)	5	3	4	3	6	5	2	6	1	4	4	7

PART – B

5 a. List the principles used in product design for automated assembly systems. **(04 Marks)**

b. With neat sketch, explain elements of the parts delivery system for assembly operation. **(08 Marks)**

c. Explain Vehicle guidance and Routing system of an Automated guided vehicle system (AGVS). **(08 Marks)**

6 a. With block diagram, explain the steps involved in retrieval CAPP system. **(08 Marks)**

b. List the decision to be made for short term capacity planning adjustments. **(05 Marks)**

c. Requirements are to be planned for component C5 in product P1. Required deliveries for P1 are 50 and 100 units during week 8 & 10 respectively. The product structure for P1 consists of S2(2) , C5(2) and M5(2) i.e 2 units each for sub – assembly, component and material. Assembly lead time for products and sub assemblies is 1 week, manufacturing lead time for components is 2 weeks and ordering lead time for raw materials is 3 weeks. Determine the time phased requirements for S2, M5 and C5 to meet the master schedule. On – hand inventories are : 100 units for M5, 50 units for C5 and zero for S2. Scheduled receipts are zero for these items. **(07 Marks)**

7 a. With block diagram, explain the configuration of machine control unit (MCU) for CNC system. **(10 Marks)**

b. Write a CNC part program to profile mill the part shown in fig. Q7(b) using word address format. Assume suitable machining parameters. **(10 Marks)**

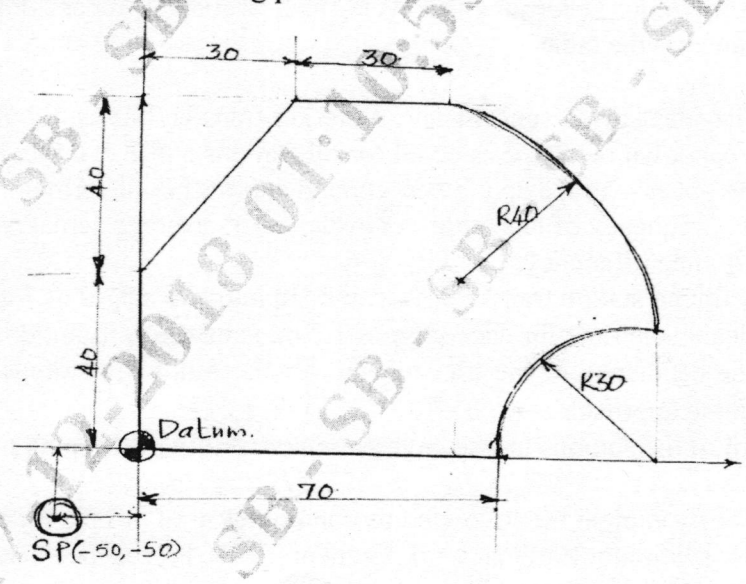

Fig.Q7(b)

8 a. Define Industrial Robotics. Briefly explain with neat sketches, physical configurations of an robot. **(12 Marks)**

b. Explain in detail sensors used in Industrial robots. **(08 Marks)**

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SRI SAIRAM COLLEGE OF ENGINEERING

CBCS SCHEME

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15ME62

Sixth Semester B.E. Degree Examination, June/July 2018
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define automation. Distinguish between fixed and programmable automation with examples. **(08 Marks)**

b. State and explain the different reasons for automation. **(08 Marks)**

OR

2 a. Explain upper bound and lower bound approach with respect to automated transfer lines. **(08 Marks)**

b. The average part produced in a certain batch manufacturing plant must be processed through an average of 8 machines, 15 new batches are launched each week. Operating time is 8 min, average set up time is 8 hours, batch size is 30 minutes, average non-operation time is 15 hrs/machine. Number of machines available in the plant is 20. The plant operates on an average of 80 production hrs/week. Determine (i) manufacturing lead time (ii) production rate (iii) plant utilization (iv) Work-in-process. **(08 Marks)**

Module-2

3 a. State and explain the different steps in computer aided design process. **(08 Marks)**

b. Explain the functions of a graphics package. **(08 Marks)**

OR

4 a. Define computer aided process planning. With a block diagram explain variant approach type of CAPP system. **(08 Marks)**

b. What do you mean by material requirement planning (MRP)? What are MRP inputs and outputs? **(08 Marks)**

Module-3

5 a. Define flexible manufacturing system? List and explain the different types of flexibility. **(08 Marks)**

b. Explain in brief with diagram the structure of AS/RS system. What are the advantages of it? **(08 Marks)**

OR

6 a. Explain the terminology with formulas:
(i) Minimum rational work element
(ii) Cycle time (iii) Precedence constraints and precedence diagram. **(06 Marks)**

b. A project has the following tasks. Its immediate predecessor and task times are given below. Using largest candidate rule balance the line and determine
(i) Number of work stations
(ii) Balance delay of line and
(iii) Line efficiency
Take cycle time = 1 min.

Tasks	1	2	3	4	5	6	7	8	9	10	11	12
Proceded by	-	-	1	1, 2	2	3	3	3, 4	6, 7, 8	5, 8	9, 10	11
T_e (min)	0.2	0.4	0.7	0.1	0.3	0.11	0.32	0.6	0.27	0.38	0.5	0.12

(10 Marks)

Module-4

7 a. With a sketch explain the classification of NC/CNC's system based on motion control systems. **(09 Marks)**

b. Write a manual part programme for machining the profile as shown in the Fig.Q7(b)? **(07 Marks)**

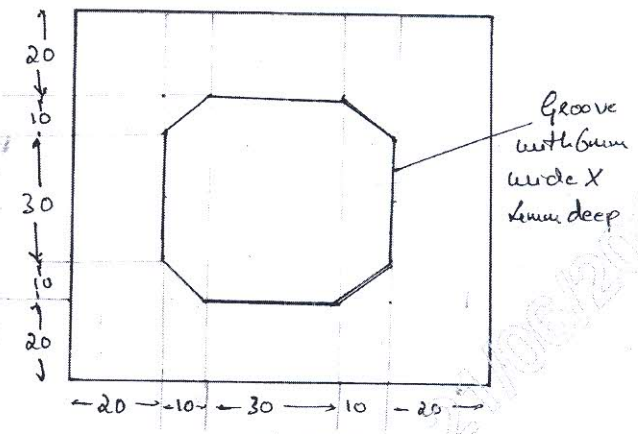

Fig.Q7(b)

OR

8 a. Explain with a neat sketch the robot configuration. **(07 Marks)**

b. Explain briefly with diagram if necessary :
(i) Slip sensors (ii) Range sensors (iii) Advantages and disadvantages. **(09 Marks)**

Module-5

9 a. Explain briefly the different steps involved in additive manufacturing system. **(08 Marks)**

b. With a neat sketch, explain the working principle of selective laser sintering. Discuss the advantages for it. **(08 Marks)**

OR

10 a. Explain the components of Industry 4.0. **(08 Marks)**

b. List and explain IOT applications in manufacturing. **(08 Marks)**

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SRI SAIRAM COLLEGE OF ENGINEERING

CBCS SCHEME

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15ME655

Sixth Semester B.E. Degree Examination, June/July 2018
Automobile Engineering

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing one full question from each module.***

Module-1

1 a. List the components of automotive engine. Mention their functions and materials used for manufacturing. **(06 Marks)**

b. With neat sketch explain the working of thermosiphon cooling system. **(06 Marks)**

c. What is the necessity of engine cooling? **(04 Marks)**

OR

2 a. What is the purpose of lubrication for an IC engine? Explain any one type of lubrication system. **(07 Marks)**

b. What is the difference between a dry liner and wet liner? **(06 Marks)**

c. What are the functions of piston rings to perform in an engine? **(03 Marks)**

Module-2

3 a. What are the requirements of a clutch? And with neat sketch explain the working of cone clutch. **(07 Marks)**

b. Explain the purpose and operation of antilock braking system. **(06 Marks)**

c. What is the principle of automatic transmission? **(03 Marks)**

OR

4 a. Explain with neat sketch:
(i) Propeller shaft (ii) Universal joint. **(08 Marks)**

b. With neat sketch, briefly describe the construction and working of hydraulic brake. **(08 Marks)**

Module-3

5 a. Explain the working of power steering. **(04 Marks)**

b. What are the differences between Battery ignition system and Magneto ignition system? **(06 Marks)**

c. Explain with neat sketch: (i) Leaf spring (ii) Coil spring **(06 Marks)**

OR

6 a. What are the types of ignition systems? Describe with diagram the battery ignition system. **(08 Marks)**

b. A motor car has a wheel base of 2.743 m and pivot centre of 1.065 m. The front and rear wheel track is 1.217 m. Calculate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheels, when the angle of inside lock is 40°. **(08 Marks)**

Module-4

7 a. Distinguish between supercharging and turbocharging. **(06 Marks)**

b. List out the various alternative fuels and briefly explain on cetane and octane numbers. **(10 Marks)**

OR

8 a. Explain different methods of supercharging. **(08 Marks)**

b. With a neat sketch, explain the different circuits of Carter carburetor. **(08 Marks)**

Module-5

9 a. Briefly explain different types of emission from IC engines. **(08 Marks)**

b. What are different emission standards? Explain Briefly. **(08 Marks)**

OR

10 a. What are catalytic converters? How they are helpful in reducing HC, CO and NO_x emissions. **(08 Marks)**

b. Write a note on Motor vehicle act. **(08 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is automation? Explain different types of automation. **(08 Marks)**

b. Explain the following terms:
i) Manufacturing lead time ii) Production rate iii) Production capacity **(06 Marks)**

c. In a manufacturing plant a part is produced in a batch size of 60 units. The batch must be routed through 8 operations to complete it. Average set up time 5 hr/operation. Average operation time is 10 min. Average non-operation time is 7 hrs/operation. Determine:
i) Manufacturing lead time in number of days of the plant runs 8 hrs shift/day.
ii) Production rate of the plant. **(06 Marks)**

2 a. Explain the various methods of work part transport in an automated flow line. **(09 Marks)**

b. What are the symbols used in an automated flow line? **(05 Marks)**

c. Sketch and explain the linear walking beam mechanism. **(06 Marks)**

3 a. Explain the upper bound approach and lower bound approach in analyzing transfer lines, without storage buffer. **(08 Marks)**

b. Discuss the starving and blocking of stations with respect to an automated flow line. **(04 Marks)**

c. The ideal cycle time of an 16 station transfer line is 1.4 min. The average down time per line will be 6 min and the probability of breakdowns per cycle is equal for all cycles and is equal to 0.004. Determine production rate and line efficiency by considering both upper bound and lower bound approaches. **(08 Marks)**

4 a. Explain the following terms with respect to line balancing:
i) Cycle time ii) Precedence constraints
iii) Precedence diagram iv) Balance delay **(08 Marks)**

b. What are the objectives of line balancing? **(06 Marks)**

c. Explain with an example, the largest candidate rule method of line balancing. **(06 Marks)**

PART – B

5 a. Discuss the principles used in product design to facilitate automated assembly. **(06 Marks)**

b. With neat figures, explain the elements of part delivery system. **(06 Marks)**

c. Discuss the functions that are performed while operating AGVS. **(08 Marks)**

6 a. With the help of a block diagram, explain retrieval CAPP systems. **(08 Marks)**

b. Explain the structure of MRP system. **(08 Marks)**

c. Briefly explain the capacity planning. **(04 Marks)**

7 a. Describe salient features of CNC systems. **(10 Marks)**

b. Discuss the advantages and disadvantages of CNC systems. **(10 Marks)**

8 a. With neat sketches, discuss the common robot configurations. **(12 Marks)**

b. Explain resolution, accuracy and repeatability, as applied to robot, **(08 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, June/July 2017
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define automation and CIM with the aid of conceptual model of manufacturing. **(06 Marks)**

b. Briefly explain the various "Automation Strategies" that can be adopted to improve the productivity. **(10 Marks)**

c. Define the term plant capacity with a mathematical relation. **(04 Marks)**

2 a. The average part produced in a certain batch manufacturing plant must be processed through an average of 8 machines. 20 new batches are launched each week. Operating time is 8 min, average setup time is 8 hrs, batch size is 30 units, average non-operation time is 15 hr/machine. Number of machines available in the plant is 20. The plant operates on an average of 80 production hrs/week. Determine
(i) MLT (ii) R_P (iii) PC (iv) U (v) WIP (vi) WIP ratio (vii) TIP ratio. **(10 Marks)**

b. Illustrate the configuration of an automated flow line. **(04 Marks)**

c. With the aid of sketches, explain any two rotary transfer mechanisms. **(06 Marks)**

3 a. Analyze the flow line performance by means of three basic measures. **(06 Marks)**

b. Explain the limits of storage buffer effectiveness. **(04 Marks)**

c. A 20 station line is divided into 2 stages of 10 stations each. The ideal cycle time of each stage is 1.2 min. All the stations in the line have the same probability of stoppage equal to 0.005. When breakdown occurs, it takes an average of 8 min, using the upper bound approach, compute the flow line efficiency for the following buffer capacity
(i) b = 0, (ii) b = ∞, (iii) b = 10, (iv) b = 100. **(10 Marks)**

4 a. Write a note on: (i) Precedence diagram (ii) Minimum rational work element. **(04 Marks)**

b. Explain Kilbridge and Wester's method. **(06 Marks)**

c. The precedence relationships and element time for a new model toy are as follows:

Element	T_e min	Immediate precedence
1	0.5	-
2	0.3	1
3	0.8	1
4	0.2	2
5	0.1	2
6	0.6	3
7	0.4	4, 5
8	0.5	3, 5
9	0.3	7, 8
10	0.6	6, 9

Using largest candidate rule method, compute (i) Number of stations required (ii) Balance delay, if the ideal cycle time is 1.0 minute. **(10 Marks)**

PART – B

5 a. Indicate the classification of an automated assembly system. **(04 Marks)**

b. Illustrate the elements of part delivery system at an assembly station. **(08 Marks)**

c. List the types of AGV's and write a note on vehicle guidance technology adopted to AGV's. **(08 Marks)**

6 a. Indicate the benefits of CAPP and explain retrieval type CAPP. **(12 Marks)**

b. What are the inputs required for carrying out an efficient MRP? Explain. **(08 Marks)**

7 a. What are NC words? Explain. **(08 Marks)**

b. Differentiate between absolute and incremental coordinate system. **(04 Marks)**

c. Write a manual part program to drill 5 holes of ϕ15 mm for the shown part in Fig.Q7(c). The plate size is 100×100×20 mm. Assume suitable data. **(08 Marks)**

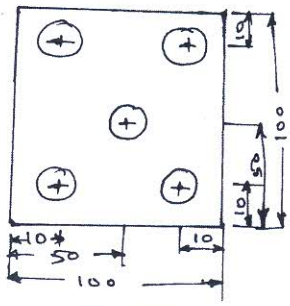

Fig.Q7(c)

8 a. With suitable sketches explain the different robot physical configurations. **(08 Marks)**

b. Explain the following :

(i) Robot anatomy

(ii) Precision of movement

(iii) Programming of robot. **(12 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, June/July 2016
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What are the different reasons for industrial automation? How do you classify automated manufacturing systems? List typical features of them. **(12 Marks)**

b. A part is produced in a batch size of 100 units. 5 operations are required to complete the processing of the part. Average setup time is 3 hours/operation, average operation time is 0.1 hour. Delay, inspection time & others account to 7 hours for each operation. Determine how many days are required to complete the batch, assuming the plant runs 8 hours shift per day. **(05 Marks)**

c. Define MLT, utilization and availability. **(03 Marks)**

2 a. With a neat sketch, explain the configuration of an automated flow line. What are the different symbols and notations practiced in production systems? **(08 Marks)**

b. Explain with neat diagram the working principle of walking beam system. **(08 Marks)**

c. What are the different controlling functions of an automated flow line? Explain. **(04 Marks)**

3 a. Explain the following :
i) Upper bound approach and lower bound approach
ii) Starting and Blocking of stations **(03 Marks)**

b. A line has 10 workstations, each with a probability of breakdown 0.02. The cycle time of line is 60 seconds and each time breakdown occurs, it takes 5 minutes to repair. The line is divided into two stages by a buffer storage. Each stage consists of 5 stations. Compute efficiency of the line with no buffer storage capacity and efficiency for two stage flow lines. **(10 Marks)**

c. What are the factors affecting line balancing? **(02 Marks)**

4 a. Write a short note on the following :
i) Precedence constraints & precedence diagram ii) Line efficiency iii) Balance delay. **(08 Marks)**

b. The demand of the assembly line with its elemental time and precedence is as given below. Construct the precedence diagram and find balance delay by Kilbridge and Wester's method. (Cycle time = 1.5 minute) **(12 Marks)**

Elements	Time (Minutes)	Immediate Predecessor
1	1	-
2	0.5	-
3	0.8	1, 2
4	0.3	2
5	1.2	3
6	0.2	3, 4
7	0.5	5
8	1.5	5, 6, 7

PART – B

5 a. With neat sketch, explain part feeding and delivery systems. **(10 Marks)**

b. Briefly explain different types of vehicle guiding systems used for AGVs. **(10 Marks)**

6 a. With a neat diagram, explain generative and retrieval CAPP systems. **(12 Marks)**

b. Define MRP process inputs and outputs. What do you mean by BOM? **(08 Marks)**

7 a. Give general configuration of a CNC system. List various advantages and disadvantages of CNC machining centers. **(08 Marks)**

b. Discuss various types of NC co-ordinate systems along with motion control systems. **(10 Marks)**

c. Describe the following codes:
i) G_{00} ii) G_{90} iii) G_{02} iv) G_{04} **(02 Marks)**

8 a. Define Industrial Robot. Enlist the different applications of Robot. **(06 Marks)**

b. How do you specify a robot? **(04 Marks)**

c. Explain with neat sketches different types of end-effectors, sensors used in robot. **(10 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, June/July 2015
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define Automation. Explain the different types of automation. **(08 Marks)**

b. Explain the following automation strategies :
i) Specialization of operator ii) Online Inspection. **(04 Marks)**

c. The parts produced in a certain batch has to be processed through an average of 6 machines. There are 20 new batches of parts launched each week. Other data as follows :
i) Average operation time = 0.1 Hr ; ii) Average setup time = 5 Hr ;
iii) Average non – operation time = 10 Hr ; iv) Average Batch size = 25 parts.
There are 18 work centers in the plant and the plant operates for an average of 70 production Hr/week. Determine i) Manufacturing lead time ii) Plant capacity iii) Production rate iv) Plant utilization. **(08 Marks)**

2 a. Explain Synchronous transfer method and Asynchronous transfer method of work transport in automation. **(08 Marks)**

b. Explain with neat sketches, the following transfer mechanisms :
i) Walking beam transfer bar system ii) Geneva mechanism. **(12 Marks)**

3 Explain the following related to analysis of an automated flow lines :
a. Partial automation.
b. Lower bound approach.
c. Upper bound approach.
d. Effect of storage. **(20 Marks)**

4 a. Explain the following terms related to line balancing : **(06 Marks)**
i) Total work context time ii) Assembly line balance iii) Line balancing.

b. The table below defines the precedence relationships and elements times for a new model :
i) Construct the precedence diagram
ii) If the Ideal time = 1 min
iii) Use Kilsridge and Westers method to assign the work station to each element and compute the balance delay and line efficiency. **(14 Marks)**

Work element	1	2	3	4	5	6	7	8	9	10	11	12
Te(min)	0.25	0.45	0.35	0.4	0.32	0.2	0.27	0.7	0.6	0.38	0.5	0.43
Preceded by	-	1	1	1	2	2,3	4	4	5	6,7	8	9,10,11

PART – B

5 a. List the principles used in product design for automated assembly. **(06 Marks)**

b. With a neat sketch, explain elements of parts delivery system. **(08 Marks)**

c. Define AGVS. List the advantages and applications of AGVS. **(06 Marks)**

6 a. With a block diagram, explain variant CADD system. **(10 Marks)**

b. What is Material requirement? Explain the structure of a MRP system. **(10 Marks)**

7 a. Discuss the advantages and disadvantages of CNC systems. **(10 Marks)**

b. Explain the fundamental steps involved in part programming for turning and milling. **(10 Marks)**

8 a. Explain the different configuration of robot, with neat sketches. **(12 Marks)**

b. Explain the following terms related to robots :

i) End effectors ii) Programming methods. **(08 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART - A

1 a. Define CIM. Explain how flexible automation is differentiated from programmable automation. **(05 Marks)**

b. Define manufacturing lead time and operation time. Represent them mathematically. **(05 Marks)**

c. An average of 10 new orders is started through a certain factory each month. An order consists of an average 75 parts to be processed through 8 machines in the factory. The operation time per machine for each part is 25 min. The non operation time averages to be 10 hrs and the required setup time is 5hrs. There were 20 workstations in the factory. The plant operates 175hrs/month. Determine i) Manufacturing lead time ii) Plant capacity iii) Utilization iv) Work in process v) TIP ratio. **(10 Marks)**

2 a. What do you understand by automated flow line? List the various symbols used to represent an automated flow line. **(06 Marks)**

b. Differentiate between In – line and Rotary configuration systems. **(06 Marks)**

c. What are Transfer mechanisms? What are its types? With a neat sketch, explain Geneva wheel transfer mechanism. **(08 Marks)**

3 a. Differentiate between Upper Bound Approach and Lower Bound Approach. **(05 Marks)**

b. Briefly explain the concept of manual assembly line, with a sketch. **(05 Marks)**

c. A transfer machine has six stations that function as follows :

Station	Operation	Process Time (min)	P_i
1	Load part	0.78	0
2	Drilling	1.25	0.02
3	Reaming	0.90	0.01
4	Tapping	0.85	0.04
5	Milling	1.32	0.01
6	Unloading	0.45	0

In addition, Transfer Time is 0.18 min. Average downtime per occurrence = 8 min. Solve the problem assuming that, when station breakdown occurs, the workparts must be removed. Determine : i) Proportion Downtime ii) Average actual production rate. **(10 Marks)**

4 a. Define the following terms : i) Minimum rational work element ii) Balance delay iii) Cycle time iv) Precedence diagram. **(08 Marks)**

b. The table below shows the element time and precedence relationships. Cycle time is 10 min. Construct the precedence diagram. Determine the number of workstations required to process all the work elements. Use ranked positional weight method. Also determine Balance delay.

Work Element Number	1	2	3	4	5	6	7	8	9	10	11	12
Time (min)	5	3	4	3	6	5	2	6	1	4	4	7
Predecessor Element	-	1	2	1	4	3,5	6	7	6	6	10	8,9,11

(12 Marks)

PART - B

5 a. With neat sketches, explain Horizontal and Vertical escapement and placement devices. **(08 Marks)**

b. What are Automated Guided Vehicles? List the types of AGV's. Write a note on vehicle guidance technology adopted in AGV's. **(12 Marks)**

6 a. Define CAPP. With block diagram, explain variant type of CAPP system. **(08 Marks)**

b. Briefly explain the fundamental concepts of MRP. **(06 Marks)**

c. What is Capacity Planning? Explain how capacity planning is generally accomplished. **(06 Marks)**

7 a. What are preparatory functions? Write a note on cutter radius compensation. **(06 Marks)**

b. Differentiate between Absolute and Incremental co-ordinate systems. **(04 Marks)**

c. The desired component part is shown in fig. Q7(c). Write a manual part programme to turn the profile of the part shown. Use Rough Turning Cycle and Finish cycle. Assume suitable process parameters. **(10 Marks)**

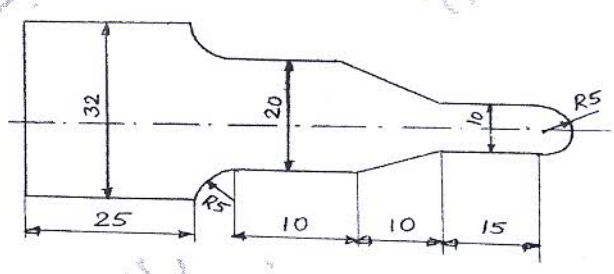

Fig.Q7(c)

8 a. With a neat sketch, explain spherical robot configuration. **(06 Marks)**

b. What are End effectors? Explain the various types of grippers available. **(08 Marks)**

c. Define the following :
i) Resolution ii) Repeatability iii) Payload. **(06 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, June/July 2014

Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define automation. Explain different types of automation system with examples. **(10 Marks)**

b. Explain the terms: i) Utilization; ii) Manufacturing lead time **(04 Marks)**

c. The average part produced in a certain batch manufacturing plant must be processed through an average of 6 machines. There are 20 new batches parts launched each week. Data for the average problem are as follows:

Average operation time = 6 min
Average setup time = 5 hours
Average non-operation time = 10 hours
Average batch size = 25 parts

There are 18 machines in the plant. The plant operates an average of 70 hours/week. Determine: i) Manufacturing lead time, ii) Plant capacity, iii) Plant utilization. **(06 Marks)**

2 a. What are the symbols used in an automated flow line? **(05 Marks)**

b. Sketch and explain the following work part transfer mechanism:

i) Linear walking beam
ii) Geneva wheel
iii) Dial indexing machine **(15 Marks)**

3 a. In a eleven (11) station transverse line the probability of station breakdowns will occur for a given work part is equal to 0.02. This probability is same for all the 11 stations. Determine the frequency line stop/cycle on this flow line using upper bound approach and lower bound approach with an average production time = 1.6 min. Determine production rate. **(10 Marks)**

b. What is the purpose of buffer storage? State its effectiveness in automated flow line. **(06 Marks)**

c. Write a short note on partial automation. **(04 Marks)**

4 a. A project has the following tasks. Its immediate predecessor and the task times are given below. Using largest candidate rule balance the line and determine:

i) Number of work stations ii) Balance delay of line iii) Line efficiency.

Take T_c = 1 min.

Tasks	1	2	3	4	5	6	7	8	9	10	11	12
Preceded by	-	-	1	1, 2	2	3	3	3, 4	6, 7, 8	5, 8	9, 10	11
T_e (min)	0.2	0.4	0.7	0.1	0.3	0.11	0.32	0.6	0.27	0.38	0.5	0.12

(12 Marks)

b. Explain the following terms in line balancing;

i) Minimum rotational work element.
ii) Total work content time
iii) Cycle time
iv) Line efficiency. **(08 Marks)**

PART – B

5 a. Explain the design for automated assembly system. **(07 Marks)**

b. Explain with a neat sketch the elements of part feeding device. **(08 Marks)**

c. List the applications of AGVs. **(05 Marks)**

6 a. With a neat sketch explain retrieval 'CAPP' system. **(10 Marks)**

b. What is a material requirement planning? Explain various inputs and outputs to MRP system. **(10 Marks)**

7 a. Describe the advantages, disadvantages and applications of CNC machine tools. **(10 Marks)**

b. Explain the fundamental steps involved in development of part programming for milling and turning. **(10 Marks)**

8 a. Explain with sketches the common robot configuration. **(10 Marks)**

b. Explain the following:

i) Work volume

ii) Precision of movement

iii) End effectors in robots

iv) Repeatability **(10 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014

Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss the following automation strategies:
   i) Specialization of operations
   ii) Increased flexibility
   iii) On-line inspection **(06 Marks)**

b. With sketch explain the automation migration strategy. **(06 Marks)**

c. There are total 24 machines in the manufacturing plant and the part produced in a batch must be processed through an average of eight machines. 24 new batches are launched each week. Average operation time is 6 min, average batch size is 30 parts, average set-up time is 6 hr and average non-operation time per batch is 12 hr/machine. The plant operates an average of 80 production hours per week and assume A = 95%. Determine:
   i) Manufacturing lead time for an average part
   ii) Production rate
   iii) Plant capacity
   iv) Plant utilization
   v) WIP
   vi) WIP ratio **(08 Marks)**

2 a. Discuss the general methods of transporting work pieces on flow lines. **(08 Marks)**

b. With sketch explain linear walking beam and Geneva wheel, work transfer mechanisms. **(08 Marks)**

c. State the importance of Buffer storage. **(04 Marks)**

3 a. Enumerate the difference between 'upper bound approach' and 'lower bound approach'. **(06 Marks)**

b. Explain the following terms used in the analysis of an automated flow lines:
   i) Partial automation
   ii) Lower bound approach **(06 Marks)**

c. A transfer line has ten station with an ideal cycle time of 30 sec. The frequency of the line stop occurrence is 0.06 stop/cycle on an average. When a stop occurs, it takes an average of 5 min to make repairs. Determine:
   i) Average production time, T_p
   ii) Average production rate, R_e
   iii) Line efficiency, E
   iv) Proportion of down time. **(08 Marks)**

4 a. Discuss the following:
   i) Minimum rational work element
   ii) Cycle time
   iii) Line efficiency
   iv) Precedence constraints **(08 Marks)**

b. Explain different methods to solve assembly line balancing problems. **(12 Marks)**

PART – B

5 a. State and briefly explain the important design principles for automated assembly system. **(06 Marks)**

b. List the parts feeding devices in delivery system and with sketch explain pick and place mechanism. **(06 Marks)**

c. An ten station assembly line has an ideal cycle time of 0.2 min. The fraction defection rate at each of the ten stations is q = 0.020 and the system operates using the instantaneous control strategy. When the breakdown occurs, it takes 1 min, an average, for the system to be put back into operation. Determine the production rate for the assembly line, the yield of good products and the proportion uptime of the system. **(08 Marks)**

6 a. Describe the three main components used in an MRP system. **(10 Marks)**

b. Define capacity planning and explain its decisions. **(05 Marks)**

c. Explain retrieval approach used for computer aided process planning systems. **(05 Marks)**

7 a. Give the classification of machining centres and explain any two machine centres. **(10 Marks)**

b. State and explain the steps involved in part programming. **(10 Marks)**

8 a. State and draw five types of joints commonly used in industrial robot construction. **(05 Marks)**

b. Draw the robot configurations for the given joint notations and briefly explain:
i) TRR ii) VRO **(10 Marks)**

c. Explain end effectors. **(05 Marks)**

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10ME61

Sixth Semester B.E. Degree Examination, June/July 2013
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What do you mean by automation? With suitable examples, distinguish between fixed and programmable automation. **(09 Marks)**

b. Discuss briefly the arguments in favour of automation. **(05 Marks)**

c. A production machine is operated 65 hr/week at full capacity, its production rate is 20 units/hour. During a certain week, the machine produced 1000 good parts and was idle in the remaining time.

i) Determine the production capacity of machine.

ii) What was the utilization of the machine during the week under consideration? **(06 Marks)**

2 a. Enlisting the objectives of automated flow lines, Discuss the two configurations used in practice. **(08 Marks)**

b. Explain three main functions that are utilized to control the operation of an automatic transfer system. **(07 Marks)**

c. Differentiate between intermittent verses power and free transfer methods of transport. **(05 Marks)**

3 a. A 20 station transfer line is divided into two stages of stations and each has an ideal cycle time of 1.2 mins. The probability of station breakdown per cycle is equal for all stations and P = 0.005 breakdowns/cycle downtime constant Td = 8.0 min compute the following for the buffer capacities: b = 0 and b = ∞.

i) Frequency of line stop per cycle.

ii) Average actual production rate.

iii) Line efficiency. **(08 Marks)**

b. What is the purpose of buffer storage? Mention two extreme cases of buffer effectiveness in automated flow lines. **(04 Marks)**

c. What are the two reasons for partial automation? Analyze the performance of partial automation along with suitable assumptions. **(08 Marks)**

4 a. Explain with mathematical expressions, different terms in line balancing. **(04 Marks)**

b. With suitable example explain the method of computing balance delay using KILBRIDGE and WESTER method and ranked positional weight method. **(16 Marks)**

PART – B

5 a. Explain different types of automated assembly system based on physical configuration. **(08 Marks)**

b. Explain briefly the automated guided vehicle system (AGV's). **(05 Marks)**

c. Explain briefly the recommendations and principles that can be applied in product design to facilitate automated assembly. **(07 Marks)**

6 a. With a neat sketch, explain variant CAPP system. **(07 Marks)**

b. List out the benefits of CAPP. **(05 Marks)**

c. What do you mean by MRP? What are the MRP outputs and benefits? **(08 Marks)**

7 a. Describe the salient features of CNC systems. **(10 Marks)**

b. Discuss the classification of CNC machine tools, with block diagrams. **(10 Marks)**

8 a. With a neat sketch, explain the common robot configurations. **(12 Marks)**

b. Explain four types of programming methods. **(08 Marks)**

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06ME72

Seventh Semester B.E. Degree Examination, December 2012
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define automation. Explain different types of automation. **(10 Marks)**

b. Explain the mathematical models, while giving mathematical equation for each teams. **(10 Marks)**

2 a. Discuss with examples types of automated flow lines. Also list the objectives of automated flow line. **(10 Marks)**

b. Sketch and explain the working of Rollez chain drive mechanism. **(05 Marks)**

c. List and explain control functions used in an automated flow line. **(05 Marks)**

3 a. Explain with examples upper bound and lower bound approaches to analyze automated flow line without storage buffer. **(08 Marks)**

b. Briefly explain partial automation in a flow line. **(04 Marks)**

c. The following data applies to a 20 station in line transfer machine. P = 0.01, T_c = 0.6min, T_α = 9min. Using upper bound approach compute,
   i) Ideal production rate
   ii) Frequency of line steps
   iii) Actual production rate
   iv) Line efficiency. **(08 Marks)**

4 a. Explain the following terms in line balancing:
   i) Minimum rational work element
   ii) Precedence diagram
   iii) Cycle time
   iv) Balance delay. **(08 Marks)**

b. A new product is to be assembled in a plant, the data gives the precedence relationship and element times:

Element	1	2	3	4	5	6	7	8
Time 'Te' min	1.0	0.5	0.8	0.3	1.2	0.2	0.5	1.5
Immediate predecessor	-	-	1, 2	2	3	3, 4	4	5, 6, 7

Using largest candidate rule method,
   i) Construct the precedence diagram for this job.
   ii) If the ideal cycle time is to be 1.5min, what is the minimum number of work stations required?
   iii) Calculate the balance delay. **(12 Marks)**

PART – B

5	a.	List the principles used in product design for automated assembly.	(04 Marks)
	b.	With neat figures explain elements of parts delivery system.	(08 Marks)
	c.	Define AGVS. Explain the functions and working of an AGVS.	(08 Marks)
6	a.	With block diagram, explain the two approaches used for designing CAPP systems.	(10 Marks)
	b.	What is material requirement planning? Explain the structure of a MRP system.	(10 Marks)
7	a.	Describe salient features of CNC systems along with a block diagram.	(10 Marks)
	b.	Discuss the advantages, disadvantages and applications of CNC machines.	(10 Marks)
8	a.	With neat figures explain the robot configurations.	(12 Marks)
	b.	Explain: i) Resolution; ii) Accuracy; iii) Repeatability as applied to robots.	(08 Marks)

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06ME72

Seventh Semester B.E. Degree Examination, December 2011

Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain different types of automation. **(06 Marks)**

b. Define the terms : i) Production capacity, ii) Manufacturing lead time, iii) Utilization. Write a mathematical equation for each. **(06 Marks)**

c. In a manufacturing plant, a part is produced in a batch size of 60 units. The batch must be routed through eight operations to complete it. Average setup time is 5 hr/operation and average operation time is 10 min. Average non operation time is 7 hours/operation. Determine :

i) Manufacturing lead time in number of days, if the plant runs one 8 hr shift/day.

ii) Production rate of the plant. **(08 Marks)**

2 a. What are the symbols used in an automated flow line? **(05 Marks)**

b. What are the reasons for implementing storage buffers in an automated production line? **(05 Marks)**

c. Sketch and explain the following work part transfer mechanisms :

i) Linear walking beam ii) Geneva wheel. **(10 Marks)**

3 a. Give the reasons for the downtime, on an automated production line. **(08 Marks)**

b. Discuss the limits of storage buffer effectiveness. **(06 Marks)**

c. A 22-station in-line transfer machine has an ideal cycle time of 0.55 min. the probability of station breakdown is p = 0.01. Average downtime = 8.0 min. per line stop. Use the upper bound approach and determine :

i) Ideal production rate ii) Frequency of line stops

iii) Average actual production rate iv) Line efficiency. **(06 Marks)**

4 a. Explain the reasons for partially automating the production line. **(04 Marks)**

b. Write a note on computerized line balancing. **(04 Marks)**

c. The table below shows the precedence relationships and element time for a new part. Ideal cycle time is 10 seconds. Construct the precedence diagram, using Kilbridge and Wester method. Compute the balance delay and line efficiency. **(12 Marks)**

Element Number	Predecessor element	Time (seconds)
1	-	5
2	1	3
3	2	4
4	1	3
5	4	6
6	3, 5	5

Element Number	Predecessor element	Time (seconds)
7	6	2
8	7	6
9	6	1
10	6	4
11	10	4
12	8, 9, 11	7

PART – B

5 a. Discuss the principles used in product design to facilitate automated assembly. **(10 Marks)**
b. Sketch any three escapement and placement devices. **(05 Marks)**
c. Explain the applications of AGV. **(05 Marks)**

6 a. With the help of a block diagram, explain retrieval CAPP systems. **(10 Marks)**
b. Describe inputs to the MRP system. **(10 Marks)**

7 a. Distinguish between machining centre and turning centre. Also mention their classification. **(05 Marks)**

b. The top view of a component is shown in Fig.Q7(b). Write a complete part program to mill the profile of the part. Part thickness is 15 mm and cutter diameter is 10 mm. Clearly show the target point of the tool and axes on the sketch of the part. Target point is (30, 30, 30) from left top corner of the part. Assume suitable data. **(15 Marks)**

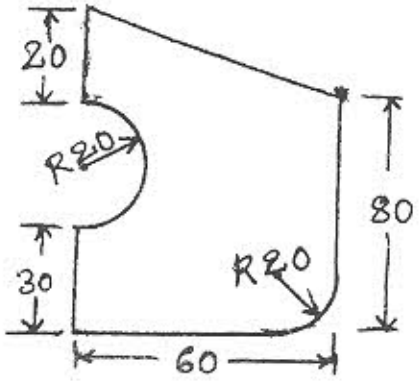

Fig.Q7(b)

8 a. With neat sketches, describe the geometrical configuration of a robot. **(12 Marks)**
b. Write a program for pick and place operation of a robot using VAL. Pick an object from the table and place it on the conveyor. Approach distance for the object on the table is 50 mm. Depart distance = 80 mm. Approach distance for the conveyor = 100 mm. Depart distance = 40 mm. Show the end effecter path. **(08 Marks)**

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06ME72

Seventh Semester B.E. Degree Examination, June/July 2011

Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. Draw sketches wherever necessary.

PART – A

1 a. Define Automation? Briefly explain with one example each of different types of automation. **(08 Marks)**

b. Explain the following terms related to manufacturing: i) Utilization & Availability. ii) W/P & T/P ratio. iii) Production rate & MLT. **(06 Marks)**

c. The average part produced in a certain batch manufacturing plant must be processed through an average of the machines. There are 20 new batches parts launched each week. Data for the above problem are;
Average operation time : 6min
Average setup time : 5 hours
Average batch size : 25 parts
Average non-operation time per batch : 10 hours
There are 18 machines in the plant. The plant operates an average of 70 production hours per week. Scrap rate is neglizable
i) Determine the manufacturing lead time.
ii) Plant capacity.
iii) Plant utilization. **(06 Marks)**

2 a. Explain the various methods of work part transport in an automated flow line. **(08 Marks)**

b. Explain with sketches the following transfer machines used for the automated flow lines.
i) Linear transfer mechanism. ii) Rotary transfer mechanism. **(12 Marks)**

3 a. Using the lower bound approach analyze the transfer lines without storage and with storage buffers. **(10 Marks)**

b. With suitable assumptions, determine the line performance for the single stage, two stage & three stage cases.

Station	P_i	Station	P_i
1	0.01	9	0.03
2	0.02	10	0.01
3	0.01	11	0.02
4	0.03	12	0.02
5	0.02	13	0.02
6	0.04	14	0.01
7	0.01	15	0.03
8	0.01	16	0.01

(10 Marks)

4 a. With suitable terminology, explain following terms related to line balancing problems.
i) Minimum Rational work element ii) Workstation process time iii) Precedence constraint & diagram iv) Balance delay. **(12 Marks)**

b. Explain with an example, any one method of line balancing. **(08 Marks)**

PART – B

5 a. Explain with sketches, the various elements of a parts delivery system. **(10 Marks)**

b. Analyse the multi station assembly machine with suitable assumption and parameters. **(06 Marks)**

c. Explain briefly i) The vehicle guidance and routing system. ii) traffic control & safety related to automated guided vehicles(AVG's). **(04 Marks)**

6 a. Explain the following two approaches designed for the computer aided process planning system i) Retrieval CAPP system. ii) Generative CAPP system. **(12 Marks)**

b. What is a material requirement planning? Explain the various inputs to the MRP system. **(08 Marks)**

7 a. Explain with a block diagram, the general configuration of a computer numerical control system (CNC). **(10 Marks)**

b. Explain the fundamental steps involved in development of part programming for milling and turning. **(10 Marks)**

8 a. Explain with sketches, the common robot configurations. **(10 Marks)**

b. Explain the different methods of programming a robot. **(08 Marks)**

c. List the various types of sensors used for the robot? **(02 Marks)**

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7. Question Papers

06ME72

Seventh Semester B.E. Degree Examination, December 2010
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define and explain automation. Describe three basic types of automated manufacturing systems. **(10 Marks)**

b. Explain the mathematical model of product life cycle. **(10 Marks)**

2 a. Classify and explain work part transport mechanisms, with examples. **(10 Marks)**

b. Explain different types of control functions used in an automated flow line. **(10 Marks)**

3 a. Explain and differentiate between the upper bound and lower bound approach, with reference to the automated flow line. **(10 Marks)**

b. A 20 station transfer line is divided into two stages of 10 stations each. The ideal cycle time of each stage is T_C = 1.2 min. All the stations in the line have the same probability of stopping, p = 0.005. Assume that the down time, T_d = 8.0 min is constant when a breakdown occurs. Using the upper bound approach, compute the line efficiency for the following buffer capacities : i) b = 0 ii) b = ∞ iii) b = 10 iv) b = 100 **(10 Marks)**

4 a. Explain the following with reference to line balancing: **(10 Marks)**
i) Minimum rational work element ii) Precedence diagram iii) Balance delay

b. In a plant, a product is to be assembled as per the following data:

Element	1	2	3	4	5	6	7	8	9	10
Time 'T_e' min	5	3	8	2	1	6	4	5	3	6
Immediate predecessor	-	1	1	2	2	3	4, 5	3, 5	7, 8	6, 9

i) Construct the precedence diagram.
ii) If the cycle time is 10 min, find the number of stations required.
iii) Compute the balance delay of the line, using the largest candidate method. **(10 Marks)**

PART – B

5 a. Explain with neat sketches, the following part feeding devices of automated assembly systems: i) Vibratory bowl feeder ii) Selector and orienter
iii) Escapement and placement devices **(10 Marks)**

b. Explain vehicle guidance methods used in AGV, for automated manufacturing systems. **(10 Marks)**

6 a. With a block diagram, explain the general procedure in a retrieval computer aided process planning system. **(10 Marks)**

b. Discuss the fundamental concepts and input to the MRP system. **(10 Marks)**

7 a. Describe salient features of CNC systems. **(10 Marks)**

b. Discuss the advantages and disadvantages of NC systems. **(10 Marks)**

8 a. With neat sketches, discuss the common robot configurations. **(12 Marks)**

b. Explain resolution, accuracy and repeatability, as applied to robots. **(08 Marks)**

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06ME72

Seventh Semester B.E. Degree Examination, Dec.09/Jan.10
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. Draw neat sketches wherever necessary.

PART – A

1 a. Define automation. Explain different types of automation systems. **(10 Marks)**

b. The average part produced in a certain batch manufacturing plant must be processed through an average of six machines. There are 20 new batches of parts launched each week. Other pertinent data are as follows.

Average	operation time	= 6 mins
Average	set up time	= 5 hrs
Average	batch size	= 25 parts
Average	non-operation time/batch	= 10 hrs.

There are 18 machines in the plant. The plant operates an average of 70 production hrs/week.

i) Determine the manufacturing lead time for an average part.
ii) Determine the plant capacity
iii) Determine the plant utilization. **(10 Marks)**

2 a. What do you understand by an automated flow line? Explain it with the help of a neat sketch and also list the objectives of automated flow line. **(10 Marks)**

b. Explain the following transfer mechanisms in automated flow the system.
i) Walking beam transfer bar system
ii) Geneva mechanism. **(10 Marks)**

3 a. With examples, explain upper bound and lower bound approaches to analyze automated flow line without storage buffer. **(08 Marks)**

b. The following data applies to a 12 station in-line transfer machine.
P = 0.01 (all stations have an equal probability of failure)
T_c = 0.3 min
T_d = 3 min.
Using upper bound and lower bound approaches, compute the following:
i) Frequency of line stops/cycle
ii) Average production rate
iii) Line efficiency. **(08 Marks)**

c. Explain briefly, partial automation in a flow line. **(04 Marks)**

4 a. Explain the following terms in line balancing:
i) Minimum rational work element
ii) Total work content
iii) Cycle time
iv) Balance delay. **(08 Marks)**

b. The following data gives the precedence relationship and element times for a new product.

Element	te (min)	Immediate predecessor
1	1.0	-
2	0.5	-
3	0.8	1, 2
4	0.3	2
5	1.2	3
6	0.2	3, 4
7	0.5	4
8	1.5	5, 6, 7

Using largest candidate rule method,

i) Construct the precedence diagram for this job

ii) If the ideal cycle time is to be 1.5 min, what is the minimum number of workstations required?

iii) Calculate the balance delay. **(12 Marks)**

PART – B

5 a. Explain with neat sketches, the in-line and dial (rotary) type of automated assembly systems. **(10 Marks)**

b. What is an automated guided vehicle system? Explain the principle of working of an AGVS. Also list the applications of AGVS. **(10 Marks)**

6 a. With a neat sketch, explain retrieval type of CAPP system. **(10 Marks)**

b. What is material requirement planning? Explain the structure of a MRP system. **(10 Marks)**

7 a. Explain the salient features of horizontal and vertical axis machining centre and list their applications. **(10 Marks)**

b. Prepare the manual part program for CNC machining of a slot and holes in a mild steel plate, a shown in Fig.7(b). Assume suitable data for machining parameters and toolings. Indicate the datum and meanings of G and M codes used in the program. **(10 Marks)**

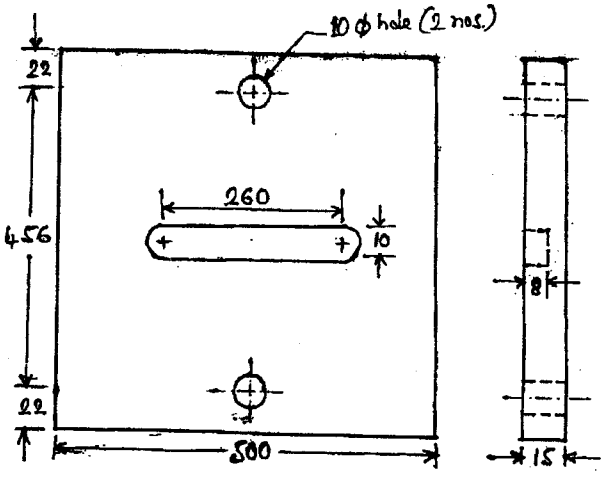

Fig.7(b) All dimensions in mm.

8 a. With neat sketches, explain the four basic configurations of industrial robots. **(12 Marks)**

b. Describe 'end effectors' and 'sensors' with respect to robots. **(08 Marks)**

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ME766/IP765

Seventh Semester B.E. Degree Examination, May / June. 08

Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note : ***Answer any FIVE full questions.***

1 a. With the help of a block diagram, explain the construction and business functions of CIM.
b. Define the following terms with mathematical expressions. **(10 Marks)**
i) Manufacturing Lead Time ii) Production Rate iii) Capacity of production iv) Work in process v) Utilization and availability. **(10 Marks)**

2 a. Describe the structure and various activities of generative CAPP system. **(10 Marks)**
b. State and explain any four benefits of CAPP systems. **(10 Marks)**

3 a. Name and explain the fundamental concepts of material requirement planning with the help of a flow chart. **(10 Marks)**
b. Explain the features of capacity planning with respect to the following : **(10 Marks)**
i) Short term adjustments ii) Long term adjustments iii) Technological evolutions.

4 a. Explain the steps involved in machine vision technique of automated inspection with a block diagram. **(10 Marks)**
b. With the help of a flow chart, explain three phases of shop floor control system. **(10 Marks)**

5 a. Sketch and explain any two types of work transfer mechanisms. **(10 Marks)**
b. Mention the steps involved in the following methods of line balancing and explain them.
i) Largest candidate rule ii) Kilbridge and Wester's method. **(10 Marks)**

6 a. Explain the following terms : i) Upper bound approach ii) Lower bound approach iii) Partial automation. **(10 Marks)**
b. A 10 station transfer machine is to produce a component. It is estimated ideal cycle time of one minute and breakdown occurs at 0.10 breakdown/cycle. Average downtime per line stop is 6 minutes. The scrap rate for processing is 5 percent. The starting casting for the components costs 1.5 dollar each and it will cost 60 dollar per hour or 1 dollar per minute to operate the transfer line. Cutting tools are estimated to cost 0.15 per work part (dollars). Compute i) Production rate ii) Number of hours required to meet a demand of 1500 units per week. iii) Line efficiency iv) Cost per unit produced. **(10 Marks)**

7 a. State and explain five applications of automatically guided vehicles. **(10 Marks)**
b. Explain the working of automatically guided vehicles by the following methods.
i) Frequency select method ii) Path switch select method. **(04 Marks)**
c. Define the following terms with respect to AGV . i) Acquisition distance ii) Dead reckoning iii) Unit load carriers. **(06 Marks)**

8 a. Explain the construction and working of various escapements and placement devices in automated assembly systems. **(10 Marks)**
b. The cycle time for a given assembly work head is 0.2 min. The part feeder has a feed rate of 20 components per minute. The probability that given component fed by the feeder will pass through selector is 0.3. The number of parts in the feed track corresponding to lower level sensor is 6. Feed track capacity is 18 parts. Determine
i) How long it will take for the supply of parts in the feed track to go form low level sensor to feed track capacity?

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ME766/IP765

Seventh Semester B.E Degree Examination, Dec. 07 / Jan. 08
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note : *Answer any FIVE full questions.*

1 a. Define Automation. With an example, explain different types of Automation systems in use. **(10 Marks)**

b. Why present conventional manufacturing industry is to be automated? Explain with specific reasons. **(10 Marks)**

2 a. Explain the following with necessary equations : i) Manufacturing Lead Time ii) Capacity iii)Work in process. **(12 Marks)**

b. Explain different types of control functions used in automated flow line. **(08 Marks)**

3 a. Explain the upper - bound and lower – bound approach with reference to automated flow line. **(10 Marks)**

b. An eight station rotary indexing machine operates with an ideal cycle time of 20 seconds. The frequency of line stop occurrences is 0.06 step/cycle on the average. When a step occurs, it takes an average of 3 min to make repairs. Determine the following.
i) Average production time. T_p ii) Average production Rate, R_p iii) Line efficiency , E
iv) Proportion of down time. **(10 Marks)**

4 a. The following lists, define the procedure relationships and element times for a new model toy. **(12 Marks)**

Element →	1	2	3	4	5	6	7	8
Te (min) →	1.0	0.5	0.8	0.3	1.2	0.2	0.5	1.5
Immediate Predecessors →	-	-	1.2	2	3	3,4	4	5,6,7

i) Construct the precedence diagram for this job.
ii) If the ideal cycle time is to be 1.5 min, what is the theoretical minimum number of stations required to minimize the balance delay?
iii) Compute the balance delay.

b. What do you mean by partial automation in a general automated flow line? Explain with necessary mathematical equations. **(08 Marks)**

5 a. Explain with examples, different types of automated assembly systems. **(12 Marks)**

b. Explain the following with reference to parts feeding devices of automated assembly systems. i) Hopper ii) Selector and orientor iii) Escapement and placement devices. **(08 Marks)**

6 a. Explain the traffic control and safety systems used in AGV's for automated manufacturing systems. **(08 Marks)**

b. With a flow chart, explain Retrieval CAPP systems. **(06 Marks)**

c. List and explain the fundamental concepts in MRP. **(06 Marks)**

7 a. List the different automatic identification systems and explain any one in detail. **(10 Marks)**

b. What do you mean by CMM? Explain any one CMM construction with neat sketch. **(10 Marks)**

8 Write short notes of the following:
a. Capacity planning
b. Data collection systems
c. Contact inspection methods.
d. Output reports in MRP. **(20 Marks)**

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NEW SCHEME

Seventh Semester B.E. Degree Examination, May 2007
ME / IP
Computer Integrated Manufacturing

Time: 3 hrs.] [Max. Marks:100

Note : ***Answer any FIVE full questions.***

1 a. List various automation strategies and indicate the probable effects of each strategy on the parameters of production concepts. **(10 Marks)**

b. What do you understand by an automated flow line? Explain with the help of a neat sketch and also list the objectives of an automated flow line. **(10 Marks)**

2 a. Differentiate between upper bound approach and lower bound approach. **(06 Marks)**

b. For a 12 station in-line transfer machine p = 0.01 (all stations have an equal probability of failure), T_c = 0.5 min, T_d = 4.0 min.
Using upper bound approach, compute the following:
i) The frequency of line stops ii) Average production iii) Line efficiency. **(06 Marks)**

c. Discuss about the limits of storage buffer effectiveness. **(08 Marks)**

3 a. Explain with mathematical expressions, different terms in line balancing. **(10 Marks)**

b. The precedence relationships and element times for a new model toy are as follows:

Element	T_e min	Immediate predecessors
1	0.5	-
2	0.3	1
3	0.8	1
4	0.2	2
5	0.1	2
6	0.6	3
7	0.4	4, 5
8	0.5	3, 5
9	0.3	7, 8
10	0.6	6, 9

Using Kilbridge and Wester method, compute:
i) Number of stations required ii) Balance delay,
if ideal cycle time is 1.0 minute. **(10 Marks)**

4 a. Draw neat sketches of various escapement and placement devices used in automatic assembly systems. **(10 Marks)**

b. An eight station assembly machine has an ideal cycle time of 6 seconds. The fraction defect rate at each of the 8 stations is q = 0.015 and the system operates using instantaneous control strategy. When a jam occurs average down time is 1 minute. Determine production rate of the assembly machine, the yield of good products (Final assemblies with no defective components) and proportion uptime of the

5 a. Enumerate principles of material handling. **(10 Marks)**
b. Explain different application categories of automated guided vehicle systems. **(10 Marks)**

6 a. What do you understand by process planning? Explain retrieval CAPP system with the help of a block diagram. **(10 Marks)**
b. Discuss about the benefits of CAPP. **(10 Marks)**

7 a. What is MRP? Discuss fundamental concepts in MRR. **(06 Marks)**
b. Describe inputs to the MRP system. **(08 Marks)**
c. List automatic identification systems and explain any two. **(06 Marks)**

8 Write short notes on any four:
a. Non Contact Inspection methods
b. CMM
c. Factory data collection system
d. Computer aided quality control
e. Argument against automation. **(20 Marks)**

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NEW SCHEME

Seventh Semester B.E. Degree Examination, Dec.06/Jan. 07
Mechanical Engineering
Computer Integrated Manufacturing

Time: 3 hrs.] [Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Explain computer integrated manufacture system with block diagram. **(08 Marks)**

b. Explain the following : i) Automation ii) Production concepts and mathematical model **(12 Marks)**

2 a. Define automated flow line. Explain with the objectives of the use of flow line automation. **(08 Marks)**

b. What is meant by methods of WORK PART TRANSPORT and Transfer Mechanism? Classify and explain each with one example. **(12 Marks)**

3 a. Discuss advantages and disadvantages of transfer lines, with storage and without storage with examples. **(12 Marks)**

b. A proposal has been made to replace one of the current manual stations with an automated work head on a 10 – station transfer line. The current system has six automated work heads and four manual stations. The current cycle time is 305. The bottle neck station is the manual station that is the candidate for replacement. The proposed automatic station would allow the cycle time to be reduced to 245. The New Station costs at Rs 25/min. Other cost data for the existing line. C_o = Rs 15/min, C_{as} = Rs 10/min , C_{at} = Rs 10/min. Break down time occurs at each of the six automatic stations with probability P = 0.01. The average down time per break down is 3 min. It is estimated that the value of P for the new automatic station would be P = 002. The average down time for the line would be unaffected. Material for the product cost Rs 50/unit. Tooling costs can be neglected (C_f = 0). It is desired to compare the challenger (the New Automated station) on the basis of cost per unit. **(08 Marks)**

4 a. Discuss the merits and demerits of automated assembly lines over manual assembly lines. **(10 Marks)**

b. Explain the types of automated assembly systems in detail. **(10 Marks)**

5 a. What are the basic principles to be considered in Automated Material Handling? **(10 Marks)**

b. What are the automated guided vehicles? Explain principle of working, write any two applications AGVS. **(10 Marks)**

6 a. What is meant by MRP? Explain how CAD/CAM and automation help in improving MRP. **(10 Marks)**

b. What is meant by capacity planning? How does a computer help in achieving a better capacity planning? Explain with an example. **(10 Marks)**

7 a. Classify the computer aided process planning techniques. Discuss their merits and demerits. What are their application areas? **(12 Marks)**

b. What are the inputs required for carrying out an efficient materials resource planning? **(08 Marks)**

8 a. Write in brief about data collection system and types of automated identification systems. **(10 Marks)**

b. How does the co-ordinate measuring machine help in ensuring quality inspection? **(10 Marks)**

NEW SCHEME

ME766/IP765

Reg. No.

Seventh Semester B.E. Degree Examination, January/February 2006

ME/IP

Computer Integrated Manufacturing

Time: 3 hrs.) (Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) Define automation. Discuss the different strategies for introducing automation in a manufacturing environment. (10 Marks)

   (b) Discuss the different types of control of an automated buffer storage system. (10 Marks)

2. (a) Discuss the merits and demerits of transfer lines with storage and without storage with examples. (12 Marks)

   (b) Discuss the scope for introducing partial automation in a manufacturing environment. Discuss its impact on productivity aspects with examples. (8 Marks)

3. (a) Discuss briefly manual methods of line balancing. (10 Marks)

   (b) Discuss the functions of automated manufacturing planning. (10 Marks)

4. (a) Discuss the advantages of automated assembly lines over manual assembly lines with examples. (10 Marks)

   (b) Discuss the functions of assembly systems in detail. (10 Marks)

5. (a) Illustrate the typical automated materials handling system with a line sketch. (10 Marks)

   (b) Discuss the principle of working of automated guided vehicles. (10 Marks)

6. (a) Discuss the basic concepts of material resource planning ? How does automation help in a better MRP system. (10 Marks)

   (b) How does computer help in achieving a better capacity planning. Discuss with examples. (10 Marks)

7. (a) What are the different types of computer aided process planning techniques ? Discuss their merits and demerits. What are their applications areas? (12 Marks)

   (b) What are the inputs required for carrying out an efficient material resource planning? (8 Marks)

8. (a) Discuss the influence of automation for achieving a better shop floor control. (10 Marks)

   (b) Discuss the importance of coordinate measuring machine in ensuring quality in inspection (10 Marks)