

**Second Semester M.Tech. Degree Examination, June/July 2011**  
**Computer Aided Production Operation Management**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions.**  
**2. Use of SQC table allowed.**

- 1 a. Express the following LP problem in matrix form  
Maximize  $Z = 3x_1 + 4x_2 + 2x_3$   
Subjected to constraints  $x_1 + x_2 + x_3 \geq 45$   
 $2x_1 + x_2 + 3x_3 \leq 65$   
 $3x_1 + 4x_2 + 5x_3 \geq 100$   
 $x_1, x_2, x_3 \geq 0.$  (06 Marks)
- b. Solve the following linear programming problem by Simplex iteration  
Maximize  $Z = 6x_1 + 3x_2 + 2x_3$   
Subjected to constraints  $2x_1 + 1x_2 + 1x_3 \leq 16$   
 $3x_1 + 2x_2 + 1x_3 \leq 18$   
 $x_2 - 2x_3 \geq 8$   
 $x_1, x_2, x_3 \geq 0.$  (14 Marks)

- 2 a. It is required to add four new machines to a machine shop for which four locations are available. The cost of assigning machines to location is given in the table 1. (10 Marks)

Table 1. Q2(a)

Machine \ Location	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>
M <sub>1</sub>	8	15	6	25
M <sub>2</sub>	12	18	9	7
M <sub>3</sub>	7	12	18	13
M <sub>4</sub>	9	10	15	5

Find the assignment cost.

- b. Given below are the values of Y for certain values of X. Find the equation of the regression line which describes the relation between X and Y. Estimate the value of Y when X = 24. (10 Marks)

X	2	4	6	8	10	12	14	16	18	20
Y	13	17	24	27	28	33	35	41	43	51

- 3 a. In a machine shop there are three sections – Lathe, milling and drilling. Weekly spare capacity available in these section is limited to 200, 300 and 250 machine hours respectively. Products P1, P2 and P3 earn unit profits of Rs 30, 50 and 40 respectively. The processing time for each of the products in various sections of the machine shop is given in the matrix below : (08 Marks)

Table - Q3(a)

Section	Processing time (h)		
	P1	P2	P3
Lathe	1	3	2
Milling	2	1	0
Drilling	2	0	3

Find the optimal product  
– mix to maximize the  
profit.

- b. A new small electrical appliance is to be assembled on a production flow line. The total job of assembling the product has been divided into minimum rational work elements. The industrial engineering department has developed time standard based on previous similar jobs. This information is given in the Table Q3(b). Production demand will be 120,000 units / year. Assembly shop operated for 40 hours per week and 50 weeks in an year.

Work element	1	2	3	4	5	6	7	8	9	10	11	12
Element time (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
Must be preceded by	-	-	1	1, 2	2	3	3	3,4	6,7,8	5,8	9,10	11

- i) Draw the precedence diagram for the assembly line.
  - ii) Determine the ideal number of work station on the line.
  - iii) Use ranked positional weights method to balance the line.
  - iv) Compute the balance delay. (12 Marks)
- 4 a. Discuss the different types of layout used for arranging physical facilities in a production shop. (08 Marks)
- b. Discuss the different heuristic algorithms used to solve quadratic assignment problem. (06 Marks)
- c. The weekly demand for a product is 200 units with a standard deviation of 20 units. The company manufactures the product in – house. But the supply of raw material for the manufacture of the product is erratic and the production lead time is 2, 3 or 4 weeks, each being alike. What is the probability that the demand for the product during the lead time will exceed 800 units? (06 Marks)
- 5 a. Discuss different inputs to an MRP system. (08 Marks)
- b. Discuss the objectives of MRP system. (04 Marks)
- c. A foreman wants to process four different jobs on three machines. The sequence of operations for all the four jobs is shaping – drilling – tapping. The process period for all the jobs on these machines are given in Table Q5(c).

Table – Q5(c)

Job	Processing Time (Min)		
	Shaping	Drilling	Tapping
1	11	3	15
2	16	8	4
3	8	7	13
4	20	5	8

Find the sequence in which the jobs should be processed so as to minimize the total time of completion of all the four jobs. Show the optimal schedule on Gantt Chart. (08 Marks)

- 6 a. Discuss briefly the heuristic rules used in production scheduling. (08 Marks)
- b. A textile company inputs 100 sq. m of cloth every day. The number of defects found in the daily sample of 100 Sq.m for last 10 days are given in Table Q. 6(b).

Table – Q6(b)

Day :	1	2	3	4	5	6	7	8	9	10
No. of defects	2	3	1	4	4	0	2	1	4	2

- Use the above data and construct C chart for quality control in the future. (06 Marks)
- c. A single sampling plan is designated by  $n = 80$ ,  $r = 3$ . Find the consumers and producers risks given that AQL is 2 percent and LTPD 10 percent. (06 Marks)
- 7 a. Discuss Deming’s 14 points for management. (10 Marks)
- b. Discuss the different stages in the Bench Marking methodology. (10 Marks)
- 8 a. Explain commonly used TQM tools. (12 Marks)
- b. Discuss the different methods of generating random numbers. (08 Marks)

\*\*\*\*\*