

GANPAT UNIVERSITY
B.TECH SEM. VIII (MECHAICAL)
REGULAR EXAMINATION MAY-JUNE - 2013
ME802 PRODUCTION & OPERATION MANAGEMENT

Time: 3 Hours

Total Marks: 70

Instructions:

- 1). All questions are **compulsory**.
- 2). Figures to the **right** indicate full marks.
- 3). Answers to the two sections must be written in **separate** answer books.
- 4). Assume all necessary data.

Section - I

Q.1 (A) A company produces two types of leather belts, say types A and B. Belt A is of a superior and belt B is of a lower quality. Profits on the two types of belts are 40 and 30 paisa per belt respectively. Each belt of type A requires twice as much time as required by a belt of type B. if all belts were of type B, the company could produce 1000 belts per day. The supply of leather, however, is sufficient only for 800 belts per day. Belt A requires a fancy buckle and only 400 fancy buckles are available per day. For belt of type B, only 700 buckles are available per day. How should the company manufacture the two types of belts in order to have a maximum overall profit? and solve by graphical methods. (4)

(B) Solve the following problems with simplex method. (8)

$$Z (\text{Max}) = 4X_1 + X_2 + 3X_3 + 5X_4$$

Subject to constraints

$$4X_1 - 6X_2 - 5X_3 - 4X_4 \geq -20$$

$$-3X_1 - 6X_2 + 4X_3 + X_4 \leq 10$$

$$-8X_1 - 3X_2 + 3X_3 + 2X_4 \leq 20$$

And

$$X_1, X_2, X_3, X_4 \geq 0$$

OR

Q.1 (A) A manufacturing company is engaged in producing three types of products: A, B and C. the production department produces, each day, components sufficient to make 50 units of A, 25 units of B and 30 units of C. the management is confronted with the problem of optimizing the daily production of products in assembly department where only 100 man-hours are available daily to assemble the products. The following additional information is available. (4)

Type of Product	Profit Contribution per Unit of product (Rs.)	Assembly time per Product (hrs.)
A	12	0.8
B	20	1.7
C	45	2.5

The company has a daily order commitment for 20 units of product A and a total of 15 units of product B and C. formulate this problem as an LP model so as to maximize the total profit and solve by graphical method.

(B) Solve the L.P problem

$$1. Z \text{ Max} = X_1 - 3X_2 + 2X_3$$

$$\text{Subject to } 3X_1 - X_2 + 3X_3 \leq 7$$

$$-2X_1 + 4X_2 \leq 12$$

$$-4X_1 + 3X_2 + 8X_3 \leq 10$$

$$\text{And } X_1, X_2, X_3 \geq 0$$

Find the X_1, X_2, X_3 and Z

Q.2 (A) A company has three plants and four warehouses. The supply and demand in units and the corresponding transportation costs are given. The table below has been taken from the solution procedure of a transportation problem: (7)

		Warehouses				Supply
		I	II	III	IV	
Plants	A	5	10	4 10	5	10
	B	6 20	8	7	2 5	25
	C	4 5	2 10	5 5	7	20
	Demand	25	10	15	5	

Answer the following questions, giving brief reasons:

- Is this solution feasible?
- Is this solution degenerate?
- Is this solution optimum?
- Does this problem have more than one optimum solution? If so, show all of them.
- If the cost for the route B-III is reduced from 7 Rs to 6 Rs per unit, what will be the optimum solution?

(B) A city corporation has decided to carry out road repairs on four main arteries of the city. The govt. has agreed to make a special grant of Rs. 50 lakh towards the cost with a conditions warrant, a supplementary token grant will also be considered favorably. The corporation has floated tenders and five contractors have spent in their bids. In order to expedite work, one road will be awarded to only one contractor. (4)

Contractor	Cost of repairs on road (Rs. Lakhs)			
	R1	R2	R3	R4
C1	9	14	19	15
C2	7	17	20	19
C3	9	18	21	18
C4	10	12	18	19
C5	10	15	21	16

- i) Find the best way of assigning the repairs to the contractors and the costs.
- ii) If it is necessary to seek supplementary grant, what should be the amount sought?
- iii) Which of the five contractors will be unsuccessful in his bid?

OR

Q.2 (A) The required data for a small project consisting of different activities are given below: (7)

Activity	Predecessor Activities	Normal		Crash	
		Duration (days)	Cost (Rs)	Duration (days)	Cost (Rs)
A	-	6	300	5	400
B	-	8	400	6	600
C	A	7	400	6	600
D	B	12	1000	4	1400
E	C	8	800	8	800
F	B	7	400	6	500
G	D, E	5	1000	3	1400
H	F	8	500	5	700

- i) Draw the network diagram for the project and find the normal and minimum project length.
- ii) If the project is to be completed in 21 days with minimum crash cost which activities should be crashed to how many days?

(B) A machine operator processes four types of items on his machine and he must choose a sequence for them. The set-up cost per change depends on the items currently on machine and the set-up to be made according to the following table: (4)

		To			
		A	B	C	D
From item	A	-	4	7	3
	B	4	-	6	3
	C	7	6	-	7
	D	3	3	7	-

If he processes each of the items once and only once each week, then how should he sequence the item on his machine? Use the method for the problem of travelling salesman.

Q.3

Explain the following (12)

- (A) Explain the Methodology of O.R.
- (B) Explain the rules of constructing the AOA network diagram.
- (C) Define the following terms:
 - I. Dummy Activity, II. Total Float, III. Free Float, IV. Predecessor Activity

Section - II

Q.4 (A) The Quarterly sales of 4 years are given below. Calculate the Quarterly sales of 5th year. (6)

Year	Quarter	Units Sales ('000)
1	1	1
	2	3
	3	4
	4	2
2	1	1
	2	3
	3	5
	4	3
3	1	2
	2	4
	3	6
	4	3
4	1	2
	2	5
	3	7
	4	4

(B) Discuss the loading and scheduling is an essential part of "Production control" (3)

(C) Discuss the various control elements and planning elements of PPC. Explain the functions of production control department. (3)

OR

Q.4 (A) Compute and construct the control chart from the following data and draw the inference from the plot. (6)

Days	Number inspected	Number Defective	Fraction Defective
3	400	2	0.0050
4	400	5	0.0125
5	400	0	0.0000
6	400	14	0.0350
7	400	3	0.0075
8	400	0	0.0000
9	400	1	0.0025
10	400	0	0.0000
11	400	18	0.0450
12	400	8	0.0200
13	400	6	0.0150
14	400	0	0.0000
15	400	3	0.0075
16	400	0	0.0000
17	400	6	0.0150

(B) Why is inspection important in an industry? Describe the various types of inspection methods (3)

(C) What is the importance of quality control in industry? Why SQC is preferred? What is OC curve? Explain. (3)

- Q.5 (A) The XYZ manufacturing company has determined from an analysis of its accounting and production data for part number 625, that its cost to purchase is Rs. 36 per order and Rs. 2 per part. Its inventory carrying charge is 18% of the average inventory. The demand for this part is 10,000 units per annum find. (4)
- What should the economic order quantity be,
 - What is the optimal no. of days' supply per optimum order?

- (B) The manager of a company manufacturing car parts has entered into a contract of supplying 1000 nos. per day of a particular part to a car manufacturer. He finds that his plant has a capacity of producing 2000nos. per day of the part. The cost of the part is Rs. 50, cost of holding stock is 12% per annum and setup cost per production run is Rs. 100. What should be run size for each production run and total optimum cost/month? How frequently should production runs be made? Shortage is not permissible. (3)

- (C) A firm producing paints plans to use simple exponential smoothing to forecast weekly demand and has collected the past data for 15 weeks as shown below: (4)

Week No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Actual Demand	30	35	20	15	10	10	15	20	30	35	30	10	12	20	30

Compute the forecast value using $\alpha = 0.2$ for 16th week, simple moving average may be used for determining forecast of the 15th week

OR

- Q.5 (A) Construct the control chart for mean and the range for the following data on the basis of fuses, sample of 4 being taken every hour each set of 4 has been arranged in ascending order of the magnitude as follows: (6)

42	42	19	36	42	51	60	18	15	69	64	61
65	45	24	54	51	74	60	20	30	109	90	78
75	68	80	89	57	75	72	26	39	113	93	94
78	72	81	77	59	78	95	40	62	118	109	109

Comment on whether the production seems to be under control.

For sample size = 4 the value of the factors $A_2 = 0.73$ $D_4 = 2.28$ $D_3 = 0$.

- (B) A manufacturer has quality control data for his products as follows: (5)

Item No.	1	2	3	4	5	6	7	8	9	10
No. of Defects	21	19	16	17	17	15	20	25	18	16

Draw c-chart for this data.

Q.6 Attempt All.

(A) Explain the following terms with respect to O.C curve.

- i. Acceptable Quality Level (AQL)
- ii. Lot Tolerance Fraction Defective (LTFD)
- iii. Consumer's Risk
- iv. Producer's Risk

(B) How value engineering helps to improve productivity?

(C) What is the different between value engineering and value analysis?

END OF PAPER

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