GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-VII(NEW) • EXAMINATION – WINTER 2016

Su	bject	Date:25/11/2016	
Su Ti Ins	bject me:1 struction 1. 2. 3.	Name:Production Optimization Techniques 0.30 AM to 1.00 PM ons: Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.	Total Marks: 70
Q.1	(a)	Explain types of mathematical models in Optimization Techni	ques. 07
	(b)	Explain Break-Even Analysis in detail.	07
Q.2	(a)	Explain in brief(a) Linear programming(b) Assumptions of a linear programming model(c) Application of linear programming.	07
	(b)	Solve the following LPP by simplex method: Maximize Z =0.6 $x_1 + 0.7 x_2$ Subject to 2.4 $x_1 + 3 x_2 \le 1200$ 5 $x_1 \le 600$ 2.5 $x_2 \le 1500$ and $x_1, x_2 \ge 0$	07
	(b)	OR Use graphical method to solve the following LPP: Minimize $Z = 20x_1 + 10x_2$ Subjected to $x_1 + 2 x_2 \le 40$ $3 x_1 + x_2 \ge 30$	07

 $4 x_1 + 3 x_2 \ge 60 \text{ and } x_1, x_2 \ge 0$

Q.3 (a) Find out optimal solution for following transportation problem.

	1	2	3	4	5	Supply
А	40	30	10	20	60	80
В	50	20	30	40	50	60
С	30	50	60	30	20	40
D	20	40	40	50	30	20
Demand	60	60	30	40	10	200

(b) Find an optimal solution to an assignment problem with following cost matrix(By Hungarian method):

 \mathbf{J}_1 J_2 J_3 J_4 M_1 10 9 7 8 7 7 M_2 5 8 M_3 5 4 6 5 2 3 5 M_4 4

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Q.3 (a) A machine operator has to perform two operations, turning and threading, on a number of different jobs. The time required to perform these operations (in minutes) for each job is known. Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs.

Job	Time for turning	Time for turning
	(minutes)	(minutes)
1	3	8
2	12	10
3	5	9
4	2	6
5	9	3
6	11	1

Also find the total processing time and idle times for turning and threading operation.

- (b) Mr. Sinha had to decide whether or not to drill a well on his farm. In his village, only 40% of the wells drilled were successful at 200 feet of depth. Some of the farmers, who did not get water at 200 feet, drilled further up to 250 feet but only 20% struck water at 250 feet. Cost of drilling is Rs.50 per feet. Mr. Sinha estimated that he would pay Rs. 18000 during a 5-year period in the present value terms, if he continues to buy water from the neighbor rather than go for the well which would have a life of 5 years. Mr. Sinha has three decisions to make: (a) should he drill up to 200 feet and (b) if no water is found at 200 feet, should he drill up to 250 feet? (c) Should he continue to buy water from his neighbor?
- Q.4 (a) Give the difference between CPM and PERT.
 - (b) A machine cost Rs. 500. Operation and maintenance cost are zero for the first year and increases by Rs.100 every year. If money is worth 5% every year, determine the best age at which the machine should be replaced. The resale value of the machine is negligibly small. What is the weighted average cost of operating the machine?

OR

- Q.4 (a) What do you understand by Float? Explain the different types of float and their 07 significance.
 - (**b**) For given activities determine:
 - (i) Critical path using PERT
 - (ii) Calculate variance and standard deviation for each activity.
 - (iii) Calculate the probability of completing the project in 26 days.

Activity	to	tm	tp	Activity	to	tm	tp
1-2	6	9	12	3-5	1	1.5	5
1-3	3	4	11	2-6	5	6	7
2-4	2	5	14	4-6	7	8	15
3-4	4	6	8	5-6	1	2	3

Q.5 (a) Define the following (1) Balking (2) Reneging (3) Jockeying. Explain the Kendal's 07 notation for a Queuing system.

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- (b) A shopkeeper has to supply 20000 units of a product every year. Product is available to him at the rate of Rs. 50. The inventory holding cost per unit per year is 7.5% of the cost of the product. If the shopkeeper has to pay Rs.75, as cost of order to be placed, then find:
 - (i) Optimum lot size,
 - (ii) Optimal total variable cost,
 - (iii) Optimal period of order to be place and
 - (iv) Profit of the year if the each unit is sold at Rs. 55

OR

- **Q.5** (a) Write short note on ABC analysis.
 - (b) A self-service store employs one cashier at a counter. Nine customers arrive on an average of every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming poisson distribution for arrival rate and exponential distribution for service rate, find
 - 1. Average number of customers in the system;
 - 2. Average number of customers in queue;
 - 3. Average time a customer spends in the system; and
 - 4. Average time a customer waits before being served.

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