GUJARAT TECHNOLOGICAL UNIVERSITY PDDC SEMESTER VII– EXAMINATION – SUMMER 2017

Su Su	ıbjec ıbiec	t Code: X71903 Date: 03/05/201 t Name: Operation Research	Date: 03/05/2017			
Ti	me: structi	02.30PM to 05.00PM Total Marks: 70)			
	1 2 3	 Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks. 				
Q.1	(a)	Solve the following problem by graphical method; Maximize; $Z = 5 X_1 + 7 X_2$	07			
		Subject to: $X_1 + X_2 \le 4$ $3 X_1 + 8 X_2 \le 24$ $10 X_1 + 7 X_2 \le 35.$ Where, $X_1, X_2 \ge 0.$				
	(b)	Write the dual of the following LPP: Maximize; $Z = 8 X_1 + 10 X_2 + 5 X_3$ Subject to: $X_1 - X_3 \leq 4$ $2 X_1 + 4 X_2 \leq 12$	07			
		$\begin{array}{ll} X_1 + \ X_2 + \ X_3 \geq 2 \\ 3 \ X_1 + 2 \ X_2 - \ X_3 = 8. \end{array} \qquad \qquad \text{Where, } X_1, \ X_2, \ X_3 \geq 0. \end{array}$				
Q.2	(a)	Solve the following problem by simplex method; Maximize; $Z = X_1 + X_2 + 3 X_3$ Subject to: $3 X_1 + 2 X_2 + X_3 \le 3$	07			
	(b)	$2 X_1 + X_2 + 2 X_3 \le 2$. Where, $X_1, X_2, X_3 \ge 0$. A manufacturer produces 2 products A and B. Each product requires raw material and man-hours. The available raw material is 400 units and a group of 10 workers, each working for 8 hours a day for 5 days. Product A needs 5 units of raw material and 10 man-hours. Whereas, the product B needs 20 units of raw material and 15 man-hours. The profits on selling of product are Rs. 45 and Rs. 80 per unit of product A and product B respectively. Formulate the LPP. Also, write the dual of the primal problem.	07			
	(b)	Solve the following problem by Big-M method; Maximiza: $7 = 3 X_{1} + 2 X_{2}$	07			
		Subject to: $2X_1 + X_2 \le 2$ $3X_1 + 4X_2 \ge 12$. Where, $X_1, X_2, X_3 \ge 0$.				
Q.3	(a)	Define the term 'game'. Solve the following game after reducing it to a 2 X 2 game. Player B $B_1 = B_2 = B_3$	07			
		Player A $\begin{array}{cccc} A_1 & 7 & 2 \\ A_2 & 6 & 2 & 7 \\ A_4 & 5 & 1 & 6 \end{array}$.				
	(b)	Use Vogel's approximation method for IBFS and MODI method for optimal solution	07			

(b) Use Vogel's approximation method for IBFS and MODI method for optimal solution 07 to find minimum transportation cost for the cost matrix given below:

Stores	1	2	3	4	Supply
Factories					
А	12	12	12	14	1000
В	14	16	14	13	700
С	13	12	11	10	900
Demand	900	800	500	400	

- Q.3 (a) What is degeneracy in transportation problems? Explain how to resolve degeneracy 07 in a transportation problem.
 - (b) Table below gives the supply, demand and unit transportation costs (in Rs.) for a **07** transportation problem.
 - 1.Obtain the initial solution using Vogel's approximation method.
 - 2. Check the solution for optimality using MODI method.

	1	2	3	Supply
А	4	4	3	35
В	5	1	2	25
С	8	3	2	40
Demand	40	40	20	

- Q.4 (a) Define the following terms : Dummy Activity, Merge event, Burst event, Looping, Dangling, Redundancy, Critical path.
 - (b) A company has a team of 4 salesmen and there are 4 districts where the company wants to start its business. After taking into account the capabilities of salesmen and the nature of districts, the company estimates the profit per day in rupees for each salesman in each district as below:

Districts	1	2	3	4			
Salesmen							
А	16	10	14	11			
В	14	11	15	15			
С	15	15	13	12			
D	13	12	14	15			
OR							

Q.4 (a) Construct the network, Determine critical path and compute total and free float for each 07 activity for a project schedule having the following characteristics:

Activity	Time (weeks)	Activity	Time (weeks)					
1-2	4	5-6	4					
1-3	1	5-7	8					
2-4	1	6-8	1					
3-4	1	7-8	2					
3-5	6	8-10	5					
4-9	5	9-10	7					

(b) Explain the Purchasing model with no shortages having economic lot size system with uniform demand. Stating clearly the assumptions made for this model, derive the formula to find economic lot size.

Q.5 (a) A machine costs Rs. 10,000. Its operating cost and resale values are given below:

A machine costs Rs. 10,000. Its operating cost and resale values are given below:								
Year	1	2	3	4	5	6	7	8
Operating cost in Rs.	1000	1200	1400	1700	2000	2500	3000	3500
Resale value in Rs.	6000	4000	3200	2600	2500	2400	2000	1600
Determine at what time it should be replaced								

Determine at what time it should be replaced.

(b) State the Bellman's principle of optimality. Explain the general procedure adopted in the 07 analysis of dynamic programming problems.

OR

- Q.5 (a) In a railway yard, goods trains arrive at a rate of 30 trains per day. Assuming that arrival time and service time distribution follows an exponential distribution with an average of 30 minutes, calculate (i) queue length (ii) probability that queue length exceeds 10 trains and (iii) if the arrival rate increases to 33 per day, what will be the changes in (i) and (ii).
 - (b) List the different types of simulation. Describe Monte-Carlo simulation technique.

07

07

07