Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII EXAMINATION – WINTER 2015

Subject Code:X71903 **Date:04/12/2015**

Subject Name: Operation Research

Time: 10:30pm to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Solve the following problem by graphical method; **07**

Maximize; $Z = 40 X_1 + 100 X_2$

Subject to:
$12 X_1 + 6 X_2 \leq 3000$
$4 X_1 + 10 X_2 \leq 2000$
$2 X_1 + 3 X_2 \leq 900$
$X_1 \geq 0$ and $X_2 \geq 0$.

(b) Explain in detail : Phases of Operations Research **07**

Q.2 **(a)** Solve the following problem by simplex method; **07**

Maximize; $Z = 3 X_1 + 2 X_2 + X_3$

Subject to:
$4 X_1 + X_2 + X_3 \leq 30$
$2 X_1 + 3 X_2 + X_3 \leq 60$
$X_1 + 2 X_2 + 3 X_3 \leq 40$
$X_1 \geq 0$, $X_2 \geq 0$ and $X_3 \geq 0$.

(b) Solve the following problem by Big-M method; **07**

Minimize; $Z = -2 X_1 - X_2 - 3 X_3$

Subject to:
$2 X_1 + 3 X_2 + 4 X_3 = 12$
$X_1 + X_2 + 2 X_3 \leq 5$
$X_1 \geq 0$, $X_2 \geq 0$ and $X_3 \geq 0$.

OR

(b) 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**

Q.3 **(a)** Differentiate clearly between - Pure strategy and Mixed strategy. Also, explain the Minimax and Maximin criteria of optimality using an example. **07**

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

Stores / Factories	1	2	3	4	Supply
A	4	6	8	13	50
B	13	11	10	8	70
C	14	4	10	13	30
D	9	11	13	8	50
Demand	25	35	105	20	

OR

Q.3 **(a)** Reduce the following game by dominance property and solve it: **07**

		Player B			
		1	2	3	4
Player A	1	3	2	4	0
	2	3	4	2	4
	3	4	2	4	1
	4	3	4	3	4

(b) Solve the following transportation problem to minimize total cost. Use North-West cost method for IBFS. **07**

Destination / Origins	A	B	C	Supply
X	2	1	2	20
Y	3	4	1	40
Demand	20	15	25	

Q.4 **(a)** A project schedule has the following characteristics: **07**

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

(i) Construct the network

(ii) Compute E and L for each event, and Find the critical path.

(b) Explain clearly with suitable examples the different costs that are involved in the inventory problems. **07**

OR

Q.4 **(a)** Define : Activity, Event, Dummy Activity, Merge event, Burst event, Critical path, Free float. **07**

(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: **07**

Districts / Salesmen	1	2	3	4
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

Q.5 **(a)** Find the optimal replacement policy for a machine with following data: **07**

Cost of machine = Rs. 12000

Year	1	2	3	4	5	6	7
Scrap value in Rs.	7000	5000	4000	3000	2500	2500	2500
Maintenance cost in Rs.	800	1200	2000	2800	3000	4100	4000

(b) Explain the general structure of a queuing system and its components. Give the classification of queuing models. **07**

OR

Q.5 **(a)** List the advantages and limitations of simulation technique. **07**

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

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