Seat No: _____________ Enrollment No: ___________________

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech. Winter 2017 - 18 Examination

Semester: I **Date: 28/12/2017**
Subject Code: 03214102 **Time: 2:00pm-4:30pm**
Subject Name: Operation Research in Water Resources Engineering **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1(A) Discuss the necessity of operation research. **(05)**

Q.1(B) How to formulate linear programming problem? **(05)**

Q.1(C) Why sensitivity analysis is to be carried out? **(05)**

Q.2 **Answer the following questions. (Attempt any three)** **(15)**

Q.2 (A) Express the following L P models into standard form :

i) Maximize $Z = 6X_1 + 2X_2$

S . T. $2X_1 + 4X_2 \leq 30$

$24X_1 + X_2 \geq 3$

$X_1, X_2 \geq 0$

ii) Minimize $Z = 4X_1 + 3X_2 + 6X_3$

S T $X_1 + 2X_2 - 3X_3 \leq 15$

$6X_1 - 4X_2 + 2X_3 \geq 15$

$8X_1 + 2X_2 + 4X_3 = -10$

$X_1, X_2, X_3 \geq 0$

Q.2 (B) Construct the dual of the problem

Maximize $Z = 3X_1 + 10X_2 + 2X_3$

S T $2X_1 + 3X_2 + 2X_3 \leq 7$

$3X_1 - 2X_2 + 4X_3 = 3$

$X_1, X_2, X_3 \geq 0$

Q.2 (C) The following matrix gives the payoff of different strategies S_1, S_2 and S_3 against the conditions N_1, N_2, N_3 and N_4. Determine the decision taken under Pessimistic approach.

	N_1	N_2	N_3	N_4
S_1	Rs 100,000	Rs 50,000	Rs – 20,000	Rs - 75,000
S_2	Rs 50,000	Rs 20,000	Rs – 40,000	Rs – 60,000
S_3	Rs 20,000	Rs -10,000	Rs -15,000	Rs -20,000

Q.2 (D) With reference to Q 2 (C) determine the decision taken under Regret approach .

Q.3 (A) Find out the solution of the following linear programming problem graphically : **(07)**

Minimize $Z = 20X_1 + 10X_2$

S T $X_1 + 2X_2 \leq 40$

$3X_1 + X_2 \geq 30$

$4X_1 + 3X_2 \geq 60$

$X_1, X_2 \geq 0$

Q.3 (B) Solve the Q 3 (A) analytically up to only two tableau. **(08)**

OR

Q.3 (B) Find out decision making under risk by expected value criteria using following data : **(08)**
Cost of a mobile is Rs 15,000 and selling price of the same is Rs 20,000 . There is no reason for a salesperson to by less than 10 and more than 15 mobiles per day . He cannot return unsold mobiles . How many mobiles she should order ?

No . of mobiles sold	Probability %
10	10
11	15
12	18
13	22
14	30
15	05

Q.4 (A) Cadilla Pharmaceuticals Limited divided its marketing area into three zones. The amount of sales depends up on the number of salesmen in each zone. The firm has been collecting the data regarding the sales and salesmen in each area over a number of years. **(07)**
The information is summarized and given below. For the next year the firm has only 9 salesmen to three different zones so that the total sales are maximum.

No. Of salesmen	Profits in lakhs of Rs	Profits in lakhs of Rs	Profits in lakhs of Rs
	Zone I	Zone II	Zone III
0	3.0	3.5	4.2
1	4.5	4.5	5.4
2	6.0	5.2	6.0
3	7.0	6.4	7.0
4	7.9	7.2	8.2
5	9.0	8.2	9.5
6	9,8	9.3	10.2
7	10.5	9.8	11.0
8	10.0	10.0	11.0
9	9.0	10.0	11.0

OR

(07)

Q.4 (A) Determine an initial basic feasible solution to the following transportation problem using row minima method.

		To					Available, tonnes
		D_1	D_2	D_3	D_4	D_5	
From	S_1	30 Rs / t	40 Rs / t	60 Rs / t	80 Rs / t	90 Rs / t	20
	S_2	20 Rs / t	100 Rs / t	10 Rs / t	50 Rs / t	80 Rs / t	30
	S_3	70 Rs / t	110 Rs / t	200 Rs / t	400 Rs/ t	30 Rs / t	15
	S_4	20 Rs / t	10 Rs / t	90 Rs / t	140 Rs/ t	160 Rs / t	13
Demand , tonnes		40	6	8	18	6	

Q.4 (B) Solve Q 4 (A) i.e. above problem by VAM. **(08)**