Total No. of Questions : 8]

SEAT No. :

PC2348

[Total No. of Pages : 4

[6354]-464

B.E. (Civil)

OPERATION RESEARCH

(2019 Pattern) (Semester-VII) (Elective-III) (401003 F)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary and clearly state.***
4) ***Use of electronic calculator is allowed.***

Q1) a) Four wagons are available at four stations. The mileages between various stations are given below: **[8]**

Wagons	Stations			
	1	2	3	4
A	30	33	28	20
B	60	30	27	26
C	70	40	15	65
D	16	17	20	30

How the wagons are to be transported, so as to minimize the total mileage covered.

b) Determine transportation cost of the following transportation model by using North - West Corner method and VAM: **[9]**

Origin	Destination			Supply
	X	Y	Z	
A	2	7	4	25
B	3	3	7	35
C	5	4	1	40
D	1	6	2	70
Demand	35	45	90	170

OR

P.T.O.

Q2) a) A marketing manager has 4 salesman & 4 sales districts. Considering capacity of salesman & nature of district, the marketing manager estimate that sales per month for each salesman in each district as in the following table: **[8]**

Salesman	Districts			
	1	2	3	4
A	32	38	40	28
B	40	24	28	21
C	41	27	33	30
D	22	38	41	36

Find the assignment of salesman to district, so that it will result in maximum sales.

b) Determine transportation cost by using Row minima, Column minima and Least cost cell method: **[9]**

Factory	Warehouse				Suppply
	P	Q	R	S	
A	10	8	7	12	250
B	12	13	6	10	250
C	18	10	12	14	500
Demand	350	250	250	150	1000

Q3) a) For the following Primal, construct the Dual: **[4]**

$$\text{Max.} Z = 40x_1 + 85x_2$$

Subject to: $5x_1 + 20x_2 \leq 400$

$10x_1 + 15x_2 \leq 450$

And $x_1, x_2 \geq 0$

b) Write the rules for constructing the Dual programming. **[5]**

c) Use Simplex method to Minimize $Z = 7x_1 + 3x_2 - 5x_3$ **[8]**

Subject to: $x_1 + 2x_2 + 3x_3 \leq 26$

$x_1 + x_2 + x_3 \leq 18$

$2x_1 + x_2 + x_3 \leq 22$

And $x_1, x_2, x_3 \geq 0$

OR

Q4) a) Use Simplex method to Maximize $Z = 200x_1 + 160x_2$ **[8]**

Subject to: $6x_1 + 16x_2 \leq 240$

$10x_1 + 13x_2 \leq 242$

$12x_1 + 6x_2 \leq 252$

And $x_1, x_2 \geq 0$

b) Use Big M method to Maximize $Z = 3x_1 - x_2$ **[9]**

Subject to: $2x_1 + x_2 \leq 2$

$x_1 + 3x_2 \geq 3$

$x_2 \leq 4$

And $x_1, x_2 \geq 0$

Q5) a) Use Golden section method to Maximize $f(x) = 60x - x^2$ in the interval of (0, 100). Carry out first 5 iterations only. **[9]**

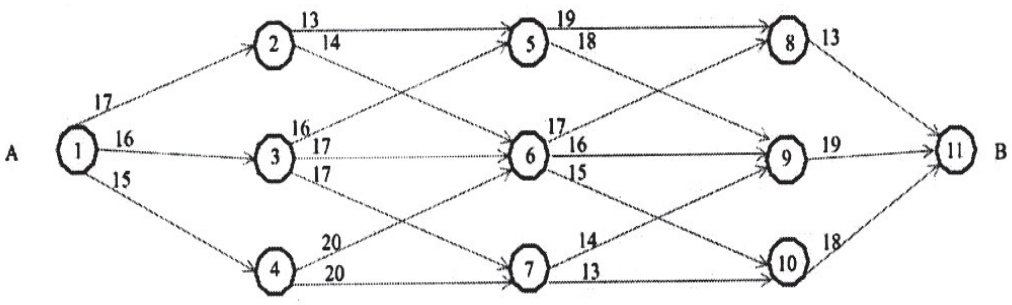
b) Use Lagrange's multiplier technique to find $f(x) = 3x_1^2 + 4x_2^2 - 5x_1.x_2 - 8x_2$ subject to $x_1 + x_2 = 4$ **[9]**

OR

Q6) a) Use Dichotomous search method to Minimize $f(x) = 24x - 0.2x^2$ in the range of (20, 120). Solve up to first 3 iterations only. **[9]**

b) Use Fibonacci method to Minimize $f(x) = x^3 - x$ in the interval of (0, 1) within 5% accuracy. **[9]**

Q7) a) The following figure shows route map of various villages. The man has to start from village 'A' and reach to village 'B' by travelling shortest path and visiting as much as possible villages. Help him to plan his journey by using dynamic programming technique. **[9]**



b) A financer can invest his money in three different fields. The total finance available with him are 6 money units. The returns are depending upon the level of investment as shown below. **[9]**

Investment	Field 1	Field 2	Field 3
0	0	0	0
2	6	4	8
4	10	12	12
6	14	14	16

Use dynamic programming and determine the maximum return and allocation to various fields.

OR

Q8) a) What are the characteristics of Game theory? **[3]**

b) A cost of machine is Rs.24000. It's resale value and operating cost for the next 6 years are as follows: **[6]**

Year	1	2	3	4	5	6
Resale value	21500	19000	16500	14000	11000	8000
Operating cost	1800	2100	2500	3100	3800	4500

Determine an optimal Replacement policy.

c) Consider the following 4 × 4 game, which represents the payoff matrix of player A, solve using dominance properties. **[9]**

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

Determine the value of game. Also find the probability of selecting strategies by player A and player B.