NJR/KS/18/3228

Bachelor of Computer Application (B.C.A.) Semester-III (C.B.S.) Examination

OPERATIONS RESEARCH–I

Paper–IV

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) **All** questions are compulsory and carry equal marks.

(2) Draw neat and labelled diagrams wherever necessary.

EITHER

1. (A) Explain significant features of operation research. 5

(B) Two different types of foods 'A' and 'B' are being considered to form a weekly diet. The minimum weekly requirements for fats carbohydrates and protein are 18, 24 and 16 units respectively. One kg. of food 'A' has 4, 16 and 8 units respectively of these ingredients and one kg. of Food 'B' has 12, 4 and 6 units respectively. The price of food 'A' is Rs. 6 per kg and that of food 'B' is Rs. 5 per kg. How many kg. of each type of food should be buy per week to minimize the cost and meet these requirements. Formulate this as L.P.P. 5

OR

(C) Explain the phases of operation research. 5

(D) Solve the following L.P.P. by graphical method :

Maximize $Z = 4x_1 + 3x_2$

subject to the constraints

$2x_1 + x_2 \leq 1000$; $x_1 + x_2 \leq 800$;

$x_1 \leq 400$; $x_2 \leq 700$ and $x_1, x_2 \geq 0$. 5

EITHER

2. (A) Solve the following L.P.P. using Simplex method :

Maximize $Z = 3x_1 + 2x_2$

subject to the constraints :

$$x_1 + x_2 \leq 3$$
$$x_1 \leq 2$$
$$-2x_1 + x_2 \leq 1$$

and $x_1, x_2 \geq 0$. 5

(B) Give the steps for formulating a dual problem of a primal problem. 5

OR

(C) Use penalty method (Big-M) to :

Maximize $Z = 2x_1 + 3x_2$

subject to the constraints :

$$x_1 + 2x_2 \leq 4$$
$$x_1 + x_2 = 3$$

and $x_1, x_2, \geq 0$. 5

(D) Obtain the dual of L.P.P. :

Minimize $Z = 4x_1 + 6x_2 + 18x_3$

subject to the constraints :

$x_1 + 3x_2 \geq 3$

$x_2 + 2x_3 \geq 5$

and $x_j \geq 0 \quad (j = 1, 2, 3)$. 5

EITHER

3. (A) Explain mathematical model for transportation problem. 5

(B) Solve the following transportation problem using Vogel's approximation method :

		Destination			
Source		1	2	3	**Availability**
1		20	22	40	100
2		24	35	17	150
3		32	30	10	125
Requirements		75	125	175	

5

OR

(C) Write down an algorithm for least-cost method. 5

(D) What is unbalanced transportation problem ?

Solve the following transportation problem :

	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	

5

EITHER

4. (A) Define assignment problem and give the mathematical formulation of the assignment problem. 5

(B) Solve the following assignment problem :

		Workers			
		W	**X**	**Y**	**Z**
	A	8	7	9	10
Jobs	**B**	7	9	9	8
	C	10	8	7	11
	D	10	6	8	7

5

OR

(C) Explain Branch and Bound technique to solve assignment problem. 5

(D) Solve the following assignment problem to minimize the cost of assignment :

Cost Matrix : $\begin{bmatrix} 8 & 7 & 6 \\ 5 & 7 & 8 \\ 6 & 8 & 7 \end{bmatrix}$ 5

5. Attempt **all** :

(A) Give the classification of models in operations research. 2½

(B) Write the following L.P.P. in standard form :

Maximize $Z = 4x_1 + 5x_2$

subject to the constraints ;

$6x_1 + 5x_2 \leq 250$; $6x_1 + 5x_2 \geq 150$;

$4x_1 + 6x_2 \leq 200$; $9x_1 + 5x_2 \geq 130$;

and $x_1, x_2 \geq 0$. 2½

(C) Explain North-West corner rule to find initial basic feasible solution of T.P. 2½

(D) Draw the associated network for the following assignment table :

	J_1	J_2	J_3
W_1	12	22	30
W_2	20	9	15
W_3	17	25	10

2½