Bachelor of Science (Information Technology) (I.T.) Semester—VI Examination

OPERATIONS RESEARCH

Paper—6

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) Solve the following LPP using graphical method :

Maximize : $Z = 15x_1 + 18x_2$

sub to : $4x_1 + 6x_2 \leq 360$

$3x_1 \qquad \leq 180$

$5x_2 \leq 200$

$x_1, x_2 \geq 0$ 5

(B) Write an algorithm of Big-M method. 5

OR

(C) Solve the following LPP using Simplex method :

Maximize : $Z = 6x_1 + 8x_2$

sub to : $5x_1 + 10x_2 \leq 60$

$4x_1 + 4x_2 \leq 40$

$x_1, x_2 \geq 0$ 5

(D) Solve the following LPP by using two phase method :

Minimize : $Z = x_1 - 2x_2 - 3x_3$

sub to : $-2x_1 + x_2 + 3x_3 = 2$

$2x_1 + 3x_2 + 4x_3 = 1$

$x_1, x_2, x_3 \geq 0$ 5

EITHER

2. (A) Solve the following LPP using Dual Simplex method :

Minimize : $Z = 2x_1 + 4x_2$

sub to : $2x_1 + x_2 \geq 4$

$x_1 + 2x_2 \geq 3$

$2x_1 + 2x_2 \leq 12$

$x_1, x_2 \geq 0$ 5

(B) Find the initial basic feasible sol^n of transportation problem by using least cost method :

Source	Destination			Supply
	D_1	D_2	D_3	
S_1	10	13	6	10
S_2	16	7	13	12
S_3	8	22	2	8
Demand	6	11	13	

5

OR

(C) Find the initial basic feasible sol^n of transportation problem using Vogel's Approximation method :

Source	Destination				Supply
	D_1	D_2	D_3	D_4	
S_1	10	2	20	11	15
S_2	12	7	9	20	25
S_3	4	14	16	18	10
Demand	5	15	15	15	

5

(D) Solve the following problem by using Hungarian method :

Operation				
Job	A	B	C	D
I	15	13	14	17
II	11	12	15	13
III	18	12	10	11
IV	15	17	14	16

5

EITHER

3. (A) Explain Critical Path Analysis in details with suitable example. 5

(B) A small project consists of seven activities for which the relevant data are given below :

Activity	Preceding Activities	Activity Duration
A	—	4
B	—	7
C	—	6
D	A,B	5
E	A,B	7
F	C,D,E	6
G	C,D,E	5

   (i) Draw the network and find the project completion time.

   (ii) Calculate total float for each of the activities.

   (iii) Draw the time scaled diagram. 5

OR

(C) Explain Dynamic programming and its application. 5

(D) Project has the following time schedule :

Activity	Time in Months
1–2	2
1–3	2
1–4	1
2–5	4
3–6	8
3–7	5
4–6	3
5–8	1
6–9	5
7–8	4
8–9	3

   Construct the network and compute :

   (i) Float for each activity

   (ii) Critical path and its duration. 5

EITHER

4. (A) Solve the assignment problem using the branch and bound algorithm. The cell entries represent the processing time in hours (c_{ij}) of the job i if it is assigned to the operator j.

Operator j

	1	2	3	4
1	23	20	21	24
2	19	21	20	20
3	20	18	24	22
4	22	18	21	23

Job i

5

(B) Explain zero-one programming model for assignment problem.   5

OR

(C) Explain in detail types of assignment problem.   5

(D) Consider the problem of assigning four sales persons to four different sales regions as shown in Table such that the total sales in maximized :

Sales region

	1	2	3	4
1	10	22	12	14
2	16	18	22	10
3	24	20	12	18
4	16	14	14	20

The cell entries represent annual sales figure in lakhs of rupees, find the optimal allocation of the sales person to different regions.   5

5. Attempt **ALL** :—

(A) Discuss Linear Programming Problem.   2½

(B) Explain Transportation Algorithm.   2½

(C) Explain Network Model in detail.   2½

(D) Explain Assignment problem in detail.   2½