NEW

2016

BCA

4th Semester Examination

OPERATIONS RESEARCH

PAPER—2203

Full Marks : 100

Time : 3 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer any *seven* questions : 7×10

1. (a) Food X contains 5 units of vitamin A and 6 units of vitamin B per gram and costs 20 paise/gm. Food Y contains 8 units of vitamin A and 10 units of vitamin B per gram and costs 30 paise/gm. The daily requirements of A and B are at least 80 and 100 units respectively. Formulate this as a L.P.P. to minimize the cost. 5

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

Maximize $Z = 3x_1 + 4x_2$

Subject to : $x_1 - x_2 \geq 0$

$-x_1 + 3x_2 \leq 3$

$x_1, x_2 \geq 0.$ 5

2. (a) Define the following : 2+1

Basic feasible solution ; Artificial variable.

(b) Solve the following L.P.P. by penalty method :

Maximize $Z = -2x_1 + x_2 + 3x_3$

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

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

$x_1, x_2, x_3 \geq 0.$ 7

3. (a) Prove that the dual of dual is primal. 5

(b) Given the L.P.P. :

Maximize $Z = 2x_1 + 3x_2 + 4x_3$

Subject to : $x_1 - 5x_2 + 3x_3 = 7$

$2x_1 - 5x_2 \leq 3$

$3x_2 - x_3 \geq 5$

$x_1, x_2 \geq 0$

and x_3 is unrestricted in sign.

Formulate the Dual of the L.P.P. 5

4. (a) Write down mathematical formulation of a Assignment problem. 3

(b) Find the optimal assignments to find the minimum cost for the assignment problem with the following cost matrix : 7

	I	II	III	IV
A	1	4	6	3
B	9	7	10	9
C	4	5	11	7
D	8	7	8	5

5. (a) Define the following in a network :

Activity, Event, Dummy activity. 3

(b) A project schedule has the following characteristics :

Activity	Time	Activity	Time
1 — 2	2	4 — 8	8
1 — 4	2	5 — 6	4
1 — 7	1	6 — 9	3
2 — 3	4	7 — 8	3
3 — 6	1	8 — 9	5
4 — 5	5		

Construct the PERT network and find critical path and time duration of the project. 7

6. (a) Write down differences between PERT and CPM. 3

(b) Solve the following transportation problem using Vogel's Approximation method : 7

	D_1	D_2	D_3	D_4	a_i
O_1	10	7	3	6	3
O_2	1	6	8	3	5
O_3	7	4	5	3	7
b_j	3	2	6	4	

7. Four jobs are to be assigned for four machines. The operation times for the various combinations of jobs and machines are given in the following table. Determine the optimum assignment schedule : 10

	Machines			
Jobs	1	2	3	4
1	1	4	6	3
2	8	7	10	9
3	4	5	11	7
4	6	7	8	5

8. (a) Write down the advantages of two phase method over penalty (Big-M) method. 3

(b) Use two-phase method to solve the following problem :

Maximize $Z = 3x_1 - x_2$

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

$x_1 + 3x_2 \leq 2$

$x_1 \leq 4$

$x_1, x_2 \geq 0$. 7

9. In the following 3×3 game, find optimal strategies and the value of the game : 10

		B		
		I	II	III
A	I	3	-2	4
	II	-1	4	2
	III	2	2	6

10. (a) What is sequencing problem ? What are its underlying assumptions ? 5

(b) Give and justify an algorithm to obtain the optimal sequence. Give a simple illustration. 5

[***Internal Assessment — 30***]