65423

IV Semester B.C.A. Examination, September/October 2023
(CBCS) (Repeaters)
MATHEMATICS
Paper – IV : Operation Research

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **all** the Sections.*

SECTION – A

I. Answer **any ten** of the following : **(10×2=20)**

1) Define operation research.
2) Mention some of the applications of operation research.
3) What is meant by optimal solution ?
4) Explain the steps involved in transportation problem.
5) Define degenerate basic feasible solution in transportation problem.
6) What are the different methods of solving assignment problems ?
7) Define expected time in PERT. Write its mathematical formula.
8) Explain Fulkerson's rule.
9) Explain the rule to determine saddle point.
10) Define maximin – minimax principle.
11) Define independent float and free float of an activity.
12) What is pay-off matrix ?

SECTION – B

II. Answer **any four** of the following : **(4×10=40)**

13) a) Explain the phases of operation research. **5**

b) A toy company manufactures two types of dolls a basic version doll A and a deluxe version doll B. Each doll of type B takes twice as long to produce as one of type A and the company would have time to make a maximum of 2000 per day. The supply of plastic is sufficient to product 1500 dolls per day. The deluxe version requires a fancy dress of which there are only 600 per day available. If the company makes a profit of Rs. 3 and Rs. 5 per doll respectively on doll A and doll B. Formulate this as an LPP. **5**

P.T.O.

14) a) What are the main features of an LPP in standard form ? **4**

b) Solve the following LPP by graphical method : **6**

Maximize $z = 2x + 3y$

Subject to $x + 2y \leq 10$

$x + y \leq 6$

$x \leq 4$

$x, y \geq 0.$

15) Obtain initial basic feasible solution for the following transportation problem using

a) North-West Corner Method. **5**

b) Matrix-Minima Method. **5**

		To			Supply
	1	2	1	4	30
From	3	3	2	1	50
	4	2	5	9	20
Demand	20	40	30	10	

16) a) Explain Hungarian method for solving assignment problem. **5**

b) Determine an initial basic feasible solution to the following transportation problem using VAM method. **5**

		Destination					
		1	2	3	4	5	Supply
Source	A	2	11	10	3	7	4
	B	1	4	7	2	1	8
	C	3	9	4	8	12	9
Demand		3	3	4	5	6	

17) a) Explain project evaluation and review techniques. **5**

b) Draw the network for the project whose activity and their precedence relationships are given below. **5**

Activity	P	Q	R	S	T	U
Predecessor	–	–	–	P, Q	P, R	Q, R

18) Write short notes on :

a) Strategies used in game theory. **5**

b) Maximin – Minimax principle. **5**

SECTION – C

III. Answer **any four** of the following : **(4×10=40)**

19) Solve by simplex method. **10**

Maximize $z = 3x_1 + 2x_2$

Subject to $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

$x_1, x_2 \geq 0.$

20) a) Solve the following transportation problem by MODI method. **5**

	1	2	3	4	Supply
I	21	16	25	13	11
II	17	18	14	23	13
III	32	27	18	41	19
Demand	6	10	12	15	

b) Write the steps to find initial basic feasible solution by matrix minima method. **5**

21) Obtain optimum basic feasible solution to the transportation problem. **10**

	To			Available
From	7	3	2	2
	2	1	3	3
	3	4	6	5
Demand	4	1	5	10

22) a) Mention the types of assignment problem. Describe the methods of an assignment problem. **5**

b) Solve the assignment problem given below : **5**

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

23) Solve the following game, use dominance method to reduce the matrix, write the strategies adopted by each player and value of game. **10**

		Y_1	Y_2	Y_3	Y_4	Y_5
		B_1	B_2	B_3	B_4	B_5
X_1	A_1	4	4	2	– 4	– 6
X_2	A_2	8	6	8	– 4	0
X_3	A_3	10	2	4	10	12

24) a) Differentiate PERT and CPM. **4**

b) Calculate the earliest start, earliest finish, least start, least finish of each activity of the project given below : **6**

Activity	1 – 2	1 – 3	2 – 4	2 – 5	3 – 4	4 – 5
Duration (in days)	8	4	10	2	5	3