CB – 479

38

IV Semester B.C.A. Examination, August/September 2023
(CBCS) (2015 – 16 & Onwards) (Repeaters)
COMPUTER SCIENCE
BCA 405 : 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 OR. Mention any 2 limitations of OR.
2) What are the different phases of OR ?
3) State Simplex method.
4) Differentiate between degenerate solution and non-degenerate solution.
5) Define slack and surplus variable.
6) State transportation problem.
7) What is assignment problem ?
8) Define unbalanced assignment problem.
9) Differentiate between predecessor and successor activities.
10) What is saddle point and value of game ?
11) Define critical path.
12) Define pay-off matrix.

SECTION – B

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

13) a) List and explain the various models used in OR. **5**

b) A retired person wants to invest upto an amount of Rs. 30,000 in fixed income securities. His broker recommends investing in two bonds. Bond A yielding 7% and Bond B yielding 10%. After some considerations, he decides to invest atmost of Rs. 12,000 in Bond B and atleast Rs. 6,000 in Bond A. He also wants the amount invested in Bond A to be atleast equal to the amount invested in Bond B. What should the broker recommend if the investor wants to maximize his return on investment ? Solve graphically. **5**

P.T.O.

14) a) Solve the following LPP by Graphical Method : 5

$Z = 20x_1 + 40x_2$

Subject to constraints $36x_1 + 6x_2 \geq 108$

$3x_1 + 12x_2 \geq 36$

$20x_1 + 10x_2 \geq 100$

$x_1, x_2 \geq 0.$

b) Write a general Linear Programming Problem (LPP) in standard form. 5

15) Determine the initial basic feasible solution to the following transportation problem using

		Destination			
		1	2	6	7
Source		0	4	2	12
		3	1	5	11
Demand		10	10	10	

Supply

a) Vogel's Approximation Method. 5

b) North-West Corner Method. 5

16) a) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows : 6

		Jobs				
		1	2	3	4	5
Persons	A	8	4	2	6	1
	B	0	9	5	5	4
	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

b) Explain Hungarian method for solving Assignment problem. 4

17) a) Write the rules of Network Construction. 4

b) Draw the network for the project whose activities and their precedence relationship are as given below : 6

Activities immediate	A	B	C	E	D	F	G	H	I
Predecessor	–	A	A	–	D	B, C, E	F	E	G, I

18) a) Define the term :

i) Maximin and minimax

ii) Game Theory. 5

b) Solve the following 2 × 2 Game pay-off matrix. Also determine the optimal strategies and value of the game. 5

	B_1	B_2
A_1	2	5
A_2	7	3

SECTION – C

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

19) Solve the following LPP using Simplex method :

Maximize $Z = 300x_1 + 200x_2$

Subject to constraint $5x_1 + 2x_2 \leq 180$

$3x_1 + 3x_2 \leq 135$

and $x_1, x_2 \geq 0$ 10

20) Solve the Assignment Problem for maximization, given the profit matrix (Profit in Rupees) 10

		Machine			
		P	Q	R	S
Job	A	51	53	54	50
	B	47	50	48	50
	C	49	50	60	61
	D	63	64	60	60

21) a) Solve the following transportation problem by MODI method. 7

		A	B	C	D	
Source	1	11	20	7	8	50
	2	21	16	20	12	40
	3	8	12	18	19	70
Demand		30	25	35	40	

b) Write the steps to find basic feasible solution by Matrix Minima method. 3

22) Calculate the total float, free float and independent float for the project whose activities are given below : **10**

Activity	1 – 2	1 – 3	1 – 5	2 – 3	2 – 4	3 – 4	3 – 5	3 – 6	4 – 6	5 – 6
Duration (in weeks)	8	7	12	4	10	3	5	10	7	4

23) Reduce the following game by dominance and find the game value : **10**

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

24) a) Differentiate between PERT and CPM. **5**

b) Construct the network for the project whose activities and three time estimate of these activities are given below. Compute :

a) Expected duration of each activity.

b) Expected variance of each activity.

c) Expected variance of project length. **5**

Activity	t_o	t_m	t_p
1 – 2	3	4	5
2 – 3	1	2	3
2 – 4	2	3	4
3 – 5	3	4	5
4 – 5	1	3	5
4 – 6	3	5	7
5 – 7	4	5	6
6 – 7	6	7	8
7 – 8	2	4	6
7 – 9	1	2	3
8 – 10	4	6	8
9 – 10	3	5	7