



CB – 479

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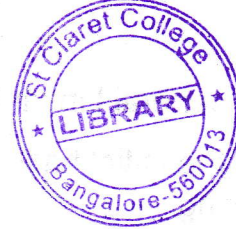
IV Semester B.C.A. Examination, August/September 2023
(CBCS) (2015 – 16 & Onwards) (Repeaters)
COMPUTER SCIENCE
BCA 405 : Operation Research

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

$$Z = 20x_1 + 40x_2$$

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

$$3x_1 + 12x_2 \geq 36$$

$$20x_1 + 10x_2 \geq 100$$

$$x_1, x_2 \geq 0.$$

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

(4x10=40)

III. Answer any 4 of the following.

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.

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		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