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**GS-641**

IV Semester B.C.A. Examination, May/June 2019  
(CBCS - F+R - 2015-16 & onwards)

## COMPUTER SCIENCE

### BCA 405 : Operations Research

Time : 3 Hours

#### SECTION - A

Max. Marks : 100

**Instruction :** Answer all the sections.  
I. Answer any 10 of the following.

10x2=20

1. Define OR and write any two applications of OR.
2. Write down the standard form of LPP.
3. What is pivot row and pivot column ?
4. Define artificial variables with example.
5. Give the mathematical formulation of transportation problem.
6. Define slack and surplus variable.
7. Explain Fulkerson's numbering rule.
8. Define optimal solution in TP.
9. Explain the steps followed in determining the saddle point.
10. Define Maximin - Minimax Principle.
11. Define Total Float and Free Float.
12. Explain the rule of dominance .

#### SECTION - B

Answer any Four of the following :

4x10=40

13. (a) Explain the various phases of Operations Research. 5
- (b) A garments factory works in three levels i.e weaving, processing and packing with capacity to produce three different types of cloths namely suitings, shirtings, woolens yielding the profit of ₹ 2, ₹ 4 and ₹ 3 per meter respectively. One meter suiting requires 3 min in weaving, 2 min in processing and 1 min in packing. One meter of shirting requires 4 min in weaving, 1 min in processing and 3 min in packing while one meter woolen requires 3 min in each department. In a Week, total run time of each department is 60, 40 and 80 hours respectively. Formulate the linear programming problem to find the product mix to maximize the profit. 5

P.T.O.

14. (a) Solve graphically the following LPP

$$\text{Max } Z = 300x + 200y$$

$$\text{subject to } 2x + y \leq 60$$

$$x \leq 25$$

$$y \leq 35 \text{ and } x, y \geq 0.$$

- (b) Express the following LPP in the standard form

$$\text{Min } Z = 3x_1 + 2x_2 + x_3$$

$$\text{Subject to } 3x_1 + 3x_2 - 5x_3 \leq 8$$

$$2x_1 + 6x_2 + 2x_3 \geq 5$$

$$x_1 - 2x_2 + 2x_3 \leq 7$$

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

15. (a) Determine the Initial Basic Feasible Solution for the following Transportation Problem (TP) Using North-West Corner rule.

	A	B	C	Available
I	2	1	3	6
II	11	4	9	5
III	10	7	4	4
IV	3	2	8	3
V	7	1	12	3
Required	9	8	4	

- (b) Use Vogel's approximation method to obtain an initial basic feasible solution of the given transportation problem (TP).

	P	Q	R	S	T	Supply
A	2	11	10	3	7	4
B	1	4	7	2	1	8
C	3	9	4	8	12	9
	3	3	4	5	6	

16. (a) Find the Optimal Assignment Schedule for Subordinates against the jobs.

	A	B	C	D
J <sub>1</sub>	8	26	17	11
J <sub>2</sub>	13	28	4	26
J <sub>3</sub>	38	19	18	15
J <sub>4</sub>	19	26	24	10

- (b) What do you mean by Assignment Problem (AP)? Describe the Hungarian method of solving AP.

17. The following table gives the list of activities and duration in hours.

Activities	1 - 2	1 - 3	1 - 4	2 - 3	3 - 4	2 - 6	3 - 5	5 - 6	6 - 8	5 - 8	4 - 7	5 - 7	7 - 8
Duration (Hrs.)	4	5	3	3	4	2	6	5	7	6	4	4	8

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- (i) Draw an arrow diagram.  
 (ii) For each activity calculate early start and early finish time.  
 (iii) Calculate Total Float (TF) and Free Float (FF).
18. (a) Solve the following game. Also find the Optimal Strategy of Player A and Player B.

		Player B	
		I	II
Player A	I	8	-3
	II	-3	1

- (b) Explain Pay Off Matrix and Strategy.

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### SECTION - C

III. Answer **any four** of the following.

4x10=40

19. (a) Give the Simplex method Algorithm.  
 (b) Solve the following LPP using Simplex Method

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$$\text{Max } Z = 3x + 8y$$

$$\text{subject to } 3x + 5y \leq 300$$

$$6x + 2y \leq 216 \text{ and } x, y \geq 0.$$

20. Using graphical method, solve the rectangular game whose payoff matrix is

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		Player B			
		1	0	4	-1
Player A	1	1	0	4	-1
	0	-1	1	-2	5

21. Solve the following TP to maximize the profit using MODI method.

	A	B	C	D	Supply
I	15	51	42	33	23
II	80	42	26	81	44
III	90	40	66	60	33
Demand	23	31	16	30	

P.T.O.



22. (a) Solve the following Assignment Problem :

	I	II	III	IV	V
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

- (b) Explain steps involved in Least-Cost Method.

23. The following table gives a list of jobs along with their time estimates

Jobs		1 - 2	1 - 3	2 - 4	3 - 4	2 - 5	4 - 5	4 - 6	6 - 8	6 - 7	4 - 7	5 - 8	7 - 8
Duration in Days	Optimistic to	1	1	2	1	2	2	3	6	5	3	4	2
	Most - Likely tm	1	4	2	1	5	5	6	15	14	12	6	4
	Pessimistic tp	7	7	8	1	14	8	15	30	17	21	8	6

- (a) Draw the Project Network.  
 (b) What is probability that the Project will be completed at least 3 days earlier than expected ? 3 days later than expected?

24. Solve the following game using Dominance method to reduce the matrix. Write the strategies adopted by each Player and Value of game.

		Player B				
		y1	y2	y3	y4	y5
Player A	x1	6	15	30	21	6
	x2	3	3	6	6	4
	x3	12	12	24	36	3

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