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

COMPUTER SCIENCE

BCA 405 : Operations Research

Time : 3 Hours

Max. Marks: 100

SECTION - A

Instruction : Answers all the sections.

I. Answer **any 10** of the following.

- 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 artifical 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 determing the saddle point.
- 10. Define Maximin Minimax Principle.
- **11.** Define Total Float and Free Float.
- 12. Explain the rule of dominance .

SECTION - B

- **II.** Answer **any Four** of the following :
 - 13. (a) Explain the various phases of Operations Research.
 - (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 programing problem to find the product mix to maximize the profit.

4x10=40

5

5

10x2=20

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- 14. (a) Solve graphically the following LPP Max Z=300x+200ysubject to $2x+y \le 60$ $x \le 25$ $y \le 35$ and $x, y \ge 0$.
 - (b) Express the following LPP in the standard form Min $Z=3x_1+2x_2+x_3$ Subject to $3x_1+3x_2-5x_3 \le 8$ $2x_1+6x_2+2x_3 \ge 5$ $x_1-2x_2+2x_3 \le 7$ $x_1 x_2 x_3 \ge 0$
- 15. (a) Determine the Initial Basic Feasible Solution for the following 4 Transportation Problem (TP) Using North-West Corner rule.

	A	В	С	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 **6** solution of the given transportation problem (TP).

	Р	Q	R	S	Т	Supply
Α	2	11	10	3	7	4
В	1	4	7	2	1	8
С	3	9	4	8	12	9
	3	3	4	5	6	8 = .= a

16. (a) Find the Optimal Assignment Schedule for Subordinates against 5 the jobs.

	A	В	С	D
J_1	8	26	17	11
J_2	13	28	4	26
J ₃	38	19	18	15
J_4	19	26	24	10

(b) What do you mean by Assignment Problem(AP)? Describe the **5** Hungerian method of solving AP.

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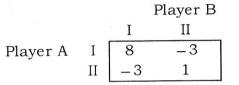
4x10=40

17. The following table gives the list of activities and duration in hours. 10

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

(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 6 A and Player B.



(b) Explain Pay Off Matrix and Strategy.

SECTION - C

III. Answer any four of the following.

19. (a) Give the Simplex method Algorithm.**4**(b) Solve the following LPP using Simplex Method**6**Max Z = 3x + 8y**6**

subject to $3x + 5y \le 300$

 $6x + 2y \le 216$ and $x, y \ge 0$.

20. Using graphical method, solve the rectangular game whose payoff matrix 10 is

	P	laye	r B		
Player A	1	0	4 -	- 1	
	-1	1 -	-2	5	

21. Solve the following TP to maximize the profit using MODI method. **10**

	А	В	С	D	Supply
Ι	15	51	42	33	23
II	80	42	26	81	44
III	90	40	66	60	33
Demand	23	31	16	30	

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22. (a) Solve the following Assignment Problem :

	Ι	II	III	IV	V
A	160	130	175	190	200
В	135	120	130	160	175
С	140	110	155	170	185
D	50	50	80	80	110
Е	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 10

	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
Days	Optimistic to	1	1	2	1	2	2	3	6	5	3	4	2
ation in	Most - Likely tm	1	4	2	1	5	5	6	15	14	12	6	4
Dura	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. 10Write the strategies adopted by each Player and Value of game.

		Player B									
_		y_1	y_2	у з	y 4	y_5					
	x_1	6	15	30	21	6					
Player A	x 2	3	3	6	6	4					
- Player A	<i>x</i> 3	12	12	24	36	3					

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