$(10 \times 2 = 20)$



IV Semester B.C.A. Examination, September 2020 (CBCS – F + R) (2015-16 and Onwards) COMPUTER SCIENCE BCA 405 : Operation Research

Time: 3 Hours Max. Marks: 100

Instruction: Answer all the Sections.

SECTION - A

KGF - 563 122

Answer any ten of the following.

1) Define operation research.

- 2) Write down the canonical form of LPP.
- 3) Define stack and surplus variable.
- 4) Mention any four models used in operation research.
- 5) Give the mathematical formulation of a transportation problem.
- 6) How do you convert a maximization problem to minimization for solving assignment problem?
- 7) What is degeneracy in TP?
- 8) Write the steps for backward pass computation.
- 9) What is a saddle point in game theory?
- 10) With mathematical formulation, define total and free float.
- 11) What is a dangling and redundancy in networking system?
- 12) What are the difference between pure strategy and mixed strategy?

SECTION - B

Answer any four of the following.

 $(4 \times 10 = 40)$

13) a) List and explain the various types of models used in OR.

b) A person requires 10, 12 and 12 units of chemicals A, B and C respectively for his garden. A liquid product contains 5, 2 and 1 units of A, B and C respectively per jar. A dry product contains 1, 2 and 4 units of A, B, C per carton. If the liquid product is sold for Rs. 3 per jar and the dry product is sold for Rs. 2 per carton. How many units of each product should be purchased, in order to minimize the cost and meet the requirements?

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- 14) a) Write the working procedure for solving Simplex Method All FIRST
 - b) Solve graphically the following

$$Z_{\text{max}} = 5x + 8y$$

s.t.c;
$$12x + 2y \le 42$$

$$x + 3y \ge 12$$

$$x + y \le 10$$

and $x, y \ge 0$



- 15) a) Explain North-West Corner Rule for solving transportation problem.
 - b) Use Vogel's approximation method to find the initial basic feasible solution to the TP.

The -	D	D ₂	D ₃	D ₄	Supply
S	21	16	25	13	11
S ₂	17	18	14	23	13
S ₃	32	17	18	48	19
Demand	6	10	12	15	SISTOM

- 16) a) Explain Hungarian method for solving assignment problem.
 - b) A department has five employees with five jobs to be performed. The time (in hours) each man will take to perform each jobs is given in the cost matrix. Solve using Hungarian method.

	Employees→								
	il eeu	1	2	3	4	5			
1	Α	10	5	13	15	16			
b	В	3	9	18	13	06			
S	C	10	7	2	2	2			
1	D	7	11	9	7	12			
	E	7	9	10	4	12			

- 17) a) What are the differences between PERT and CPM?
 - b) A small project consist of the following activities (with times).

Activity	Α	В	C	D	EA	n Fal	G	Н	
Predecessor	, i_en	comits	9120	Α	В	С	D, E	В	H, F
Estimated time (weeks)	3	5	4	2	3	9	8	7	9

Draw the network diagram and identify the CPM.

18) a) Define the term: (i) maximin and minimax (ii) game theory.

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b) Solve the following pay-off matrix. Also determine the optimal strategies and value the game.

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	B ₁	B ₂
A ₁	5	1
A ₂	3	4

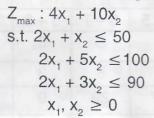
SECTION - C

III. Answer any four of the following.

 $(4 \times 10 = 40)$

19) Solve the following LPP by Simplex Method

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20) Solve the following TP to minimize the profit using MODI method by NWCR Rule. 10

S	Buse office in	TP Z	Destinations		
0	to slui a gostin	1	2	3	Capacity
r	1	2	2	3	10
c e s	2	4	1 1	2	15
	3	1	3	1	40
	Demand	20	15	30	21

- 21) a) Write the difference between transportation problem and assignment problem.
 - b) Solve the following assignment problem by maximizing the profit.

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	1	2	3	4	
A	16	10	14	11	
В	14	11	15	15	
C	15	15	13	12	
D	13	12	14	15	

22) a) Explain the following terms:

(2+2=4)

- i) pay-off matrix.
- ii) fair game.
- b) Solve the following game using dominance method to reduce the matrix.

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		Player B						
		B ₁	B_2	B ₃	B ₄			
	A ₁	20	15	12	35			
Player A	A	25	14	8	10			
	A_3	5	4	11	0			

23) The following table shows the jobs of a network along with their estimates. 10

Jobs	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
t _o	1	2	2	2	7	5	5	3	8
t _m	7	5	14	5	10	5	8	3	17
t _p	13	14	16	8	19	17	29	9	32

Draw the project network and find the probability of the project completing in 40 days.

- 24) a) (i) Explain principle of dominance (ii) Explain Fulkerson's rule of numbering system. (2+2=4)
 - b) Solve the following TP by Matrix Minima Method .

40	D ₁	D ₂	D_3	D ₄	Supply
S ₁	90	30	50	10	7
S ₂	70	30	40	60	9
S ₃	40	8	70	20	18
Required	5	8	7	14	

