SE – 343

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

I. Answer **any ten** of the following. (10×2=20)

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

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

13) a) List and explain the various types of models used in OR. 4

   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 ? 6

14) a) Write the working procedure for solving Simplex Method. **4**

b) Solve graphically the following

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

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

$x + 3y \geq 12$

$x + y \leq 10$

and x, y ≥ 0 **6**

15) a) Explain North-West Corner Rule for solving transportation problem. **4**

b) Use Vogel's approximation method to find the initial basic feasible solution to the TP. **6**

	D_1	D_2	D_3	D_4	Supply
S_1	21	16	25	13	11
S_2	17	18	14	23	13
S_3	32	17	18	48	19
Demand	6	10	12	15	

16) a) Explain Hungarian method for solving assignment problem. **3**

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. **7**

Employees→

		1	2	3	4	5
j o b s ↓	A	10	5	13	15	16
	B	3	9	18	13	06
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

17) a) What are the differences between PERT and CPM ? **3**

b) A small project consist of the following activities (with times). **7**

Activity	A	B	C	D	E	F	G	H	I
Predecessor	–	–	–	A	B	C	D, E	B	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. **4**

b) Solve the following pay-off matrix. Also determine the optimal strategies and value the game. **6**

	B_1	B_2
A_1	5	1
A_2	3	4

SECTION – C

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

19) Solve the following LPP by Simplex Method. **10**

$Z_{max} : 4x_1 + 10x_2$

s.t. $2x_1 + x_2 \le 50$

$2x_1 + 5x_2 \le 100$

$2x_1 + 3x_2 \le 90$

$x_1, x_2 \ge 0$

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

Sources	Destinations			
	1	2	3	Capacity
1	2	2	3	10
2	4	1	2	15
3	1	3	1	40
Demand	20	15	30	

21) a) Write the difference between transportation problem and assignment problem. **5**

b) Solve the following assignment problem by maximizing the profit. **5**

	1	2	3	4
A	16	10	14	11
B	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. **6**

Player B

Player A		B_1	B_2	B_3	B_4
	A_1	20	15	12	35
	A_2	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 . **6**

	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	