UG – 419

IV Semester B.C.A. Examination, September/October 2022
(CBCS) (F+R) (2015 – 16 and Onwards)
COMPUTER SCIENCE
BCA 405 : Operations 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) What is Operations Research ?
2) Write the standard form of linear programming problem.
3) Define slack and surplus variable.
4) What are transportation problems ?
5) Define basic feasible solution and optimum solution in transportation problems.
6) What are the different methods of solving assignment problems ?
7) How do you convert maximization problem to minimization for solving assignment problems ?
8) Explain Fulkerson's rules.
9) Define optimistic time and pessimistic time.
10) What are the applications of PERT/CPM ?
11) Define saddle point and value of the game.
12) What are the different methods available to solve games with mixed strategies ?

SECTION – B

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

13) a) Explain phases of operations research. **5**

b) A company produces two types of leather belts, type-A and type-B. Profits on two types of belts are Rs. 40 and Rs. 30 respectively per belt. Each belt of type-A requires twice as much time required for a belt of type-B and the company could produce 1000 belts per day. But the supply of leather is sufficient only for 800 belts per day. Belt of type- 'A' requires a fancy buckle and only 400 fancy buckles are available for this, per day. For belt of type-B, only 700 buckles are available per day. Formulate the problem as LPP. **5**

P.T.O.

14) a) Explain the steps involved in graphical solution to LPP. **5**

b) Solve the following LPP by graphical method : **5**

Maximize, $z = 2x_1 + 3x_2$

Subject to $2x_1 + x_2 \leq 12$

$x_1 + 3x_2 \leq 15$

$x_1, x_2 \geq 0.$

15) Determine the initial basic feasible solution to the following transportation problem using

a) North-West Corner Method **4**

b) Vogel's Approximation Method. **6**

		Destination				Supply
		1	2	3	4	
Source	1	21	16	15	3	11
	2	17	18	14	23	13
	3	32	27	18	41	19
Demand		6	10	12	15	

16) a) Explain Hungarian method for solving assignment problem. **5**

b) Find the optimal assignment schedule for given table with cost of each job on each machine. **5**

		Machine			
		W	X	Y	Z
Job	A	18	24	28	32
	B	8	13	17	18
	C	10	15	19	22

17) The following table gives the list of activities and duration in hours : **10**

Job	1 – 2	1 – 3	1 – 4	2 – 5	3 – 4	3 – 7	4 – 5	4 – 6	5 – 6	4 – 7	6 – 7
Duration	20	24	8	20	16	24	0	18	0	4	12

1) Draw the arrow diagram.

2) For each activity calculate early start and early finish time. Latest start and latest finish time.

3) Calculate Total Float (TF) and Free Float (FF).

18) a) Explain pay off matrix and strategy. **5**

b) Solve the following game. Find the optimal strategy of Player A and Player B. **5**

		Player B		
		I	II	III
Player A	I	–3	–2	6
	II	2	0	2
	III	5	–2	– 4

SECTION – C

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

19) Solve the following LPP by simplex method : **10**

Maximize, $z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + 4x_2 \leq 420$

$3x_1 + 2x_3 \leq 460$

$x_1 + 2x_2 + x_3 \leq 430.$

20) a) Explain the steps involved in matrix-minima method. **5**

b) Solve the following transportation problem by Least Cost Method. **5**

		To				Supply
From		10	20	5	7	10
		13	9	12	8	20
		4	5	7	9	30
		14	7	1	0	40
		3	12	5	19	50
Demand		60	60	20	10	

21) a) Write the difference between transportation problem and assignment problem. **4**

b) Solve the transportation problem using MODI method. **6**

		To				
		I	II	III	IV	
From	A	15	10	17	18	2
	B	16	13	12	13	6
	C	12	17	20	11	7
		3	3	4	5	

22) a) Find the optimal assignment for the following problem : **5**

	A	B	C	D
W	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

b) Write the difference between PERT and CPM. **5**

23) a) Explain the different phases of project-scheduling by PERT/CPM. **5**

b) Draw the network diagram for the following data : **5**

Job	Predecessor
A	–
B	–
C	A
D	A
E	B, C
F	A
G	F
H	D, E
I	G, H
J	G, H
K	G, H
L	J, K, L
M	J, K, L
N	K, J

24) Use the dominance principle to solve the following game. **10**

Player B

			y_1	y_2	y_3	y_4	y_5
			B_1	B_2	B_3	B_4	B_5
	x_1	A_1	4	4	2	– 4	– 6
Player A	x_2	A_2	8	6	8	– 4	0
	x_3	A_3	10	2	4	10	12