BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – Bachelor of Science (Honours) in Computer Science

Course Name - Mathematics-III

Course Code – BCS402

(Semester – 4)

Time allotted: 3 Hours **Full Marks : 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Questions) 10 x 1 = 10

1. ***Choose the correct alternative from the following:***

(i) For a travelling salesman who has visited *n* cities, the number of possible routes are

a. n! b. (n + 1)!
c. n - 1 d. (n - 1)!

(ii) A constraint that does not affect the feasible region is a

a. non-negativity constraint b. slack constraint
c. redundant constraint d. standard constraint

(iii) If a variable x_i is unrestricted in sign in a primal problem, then the corresponding i^{th} constraint in the dual problem will be

a. $\leq$ type b. $\geq$ type
c. equality constraint d. none of these

(iv) In a Transportation problem with *m* origin and *n* destination ,if the total number of allocated cells is less than m + n – 1, it implies that the solution is

a. optimal b. degenerate solution
c. not optimal d. None of these

(v) Non negative condition in an L.P. model implies

a. a positive coefficient of variables in objective function b. a positive coefficient of variables in any constraint
c. non negative value of resources d. None of the above

(vi) The method used for solving an Assignment problem is called

a. Reduced matrix method
b. MODI method
c. Hungarian method
d. None of the above

(vii) Let the time estimates for a particular activity be t_o = 6 days, t_m = 8 days, t_p = 10 days. Then the expected time t_c is (where the symbols have their usual meanings)

a. 7 days
b. 8 days
c. 9 days
d. 10 days

(viii) One disadvantage of using North-West Corner rule to find initial solution to the transportation problem is that

a. it is complicated to use
b. it does not take into account cost of transportation
c. it leads to a degenerate initial solution
d. All of the above

(ix) In MODI method $\Delta_{ij} = 0$ value for (i, j) th cell indicates

a. no feasible solution
b. solution is not optimal
c. alternative optimal solution exist
d. None of these.

(x) In a PERT network, the starting vertex is a

a. burst node
b. merge node
c. root
d. None of these.

Group – B

(Short Answer Type Questions) 3 x 5 = 15

Answer any three from the following :

2. Using Graphical method, show that the following L.P.P has unbounded solution. [5]

$$\text{Maximize } z = 3x + 4y$$
$$\text{subject to } x - y \geq 0$$
$$-x + 3y \leq 3$$
$$x, y \geq 0$$

3. Consider the game with pay off matrix: [5]

	Player B		
Player A	B1	B2	B3
A1	2	-2	3
A2	-3	5	-1

Determine the Optimal strategies for player A and B using Graphical method. Also determine the values of the game.

4. Find only one basic feasible solution of the system of equations [5]

$$2x_1 + 3x_2 - x_3 + 4x_4 = 8$$
$$x_1 - 2x_2 + 6x_3 - 7x_4 = -3$$
and $x_1, x_2, x_3, x_4 \geq 0$

5. Solve the Assignment problem [5]

	1	2	3	4	5
A	15	21	6	4	9
B	3	40	21	10	7
C	9	6	5	8	10
D	14	8	6	9	3
E	21	16	18	7	4

6. Prove that dual of the dual is primal. [5]

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following

7. (a) A firm makes two types of furniture – chairs and tables. The profit for [5+5]
calculated by the accounting department is Rs. 20 per chair and Rs.30 per tal
are to be processed on three machines M_1, M_2, M_3. The time required in hou
and total time available in hours per week on each machine is as follows:

Machine	Chair	Table	Available Time(hrs)
M_1	3	3	36
M_2	5	2	50
M_3	2	6	60

(i) Give a mathematical formulation to this linear programming problem
profit.

(ii) Use graphical method to solve this problem.

(b) Solve the 2x2 person zero sum game [5]

	Player B		
Player A		B1	B2
	A1	2	5
	A2	7	3

8. (a) Find out the dual of the following problem: [7]

Maximize $z = 2x_1 + 3x_2 - 4x_3$

subject to $x_1 + 2x_2 + x_3 \geq 2$

$x_1 + 3x_3 = 7$

$x_1 - 5x_2 + x_3 \leq 5$

$x_1, x_3 \geq 0$ and x_2 is unrestricted

(b) [8]

Find the optimal solution and the corresponding cost of transportation in the following Transportation problem:

	D1	D2	D3	D4	Supply
O1	23	27	16	18	30
O2	12	17	20	51	40
O3	22	28	12	32	53
Demand	22	35	25	41	

9. (a) Solve the following L.P.P by Big M method : [8]

$$\text{Maximize } z = 5x_1 + 8x_2$$

$$\text{subject to } 3x_1 + 2x_2 \geq 3$$

$$x_1 + 4x_2 \geq 4$$

$$x_1 + x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

(b) Use Simplex method to obtain the inverse of the matrix $\begin{pmatrix} 4 & 2 \\ 1 & 5 \end{pmatrix}$ [7]

10. (a) The Head of the Department has five jobs A, B, C, D, E and five sub-ordinates V, W, X, Y, and Z. The number of hours each sub-ordinates would take to perform each job is as follows: [8]

	V	W	X	Y	Z
A	3	5	10	15	8
B	4	7	15	18	8
C	8	12	20	20	12
D	5	5	8	10	6
E	10	10	15	25	10

How would the jobs be allocated to minimize the total time?

(b) Prove that $x_1 = 2,\ x_2 = 3,\ x_3 = 1$ is a feasible solution of the system of equatic [7]

$$2x_1 + x_2 + 4x_3 = 11$$

$$3x_1 + x_2 + 5x_3 = 14$$

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

Reduce the F.S to two different B.F.S.

11. (a) Solve the game using Dominance method whose pay off matrix is given by [8]

		B			
		B1	B2	B3	B4
A	A1	2	1	4	0
	A2	3	4	2	4
	A3	4	2	4	0
	A4	0	4	0	8

(b) A small project consists of eleven activities. The details of the activities along with duration of days are given below: [4+3]

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M
Predecessor	-	A	B	A	D	E	-	G	J,H	-	A	C,K	I,L
Duration(day)	6	4	7	2	4	10	2	10	6	13	9	3	5

(i) Draw the network diagram.

(ii) Find the critical path and critical activities and project duration.
