Registration Number:

Date & Session

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU -27

BCA(DATA ANALYTICS) – V SEMESTER

SEMESTER EXAMINATION: OCTOBER 2022

(Examination conducted in December 2022)

BCADA5222 : OPERATIONS RESEARCH

Time: 2 ½ Hours **Max Marks: 70**

This paper contains FOUR printed pages and THREE parts

PART - A

Answer ALL the questions **10 x 1 = 10**

1. Operations Research provides
   a) Earliest solution
   b) Feasible solutions
   c) Scientific approach to solutions
   d) Statistical approach to solutions

2. The distinguishing feature of an LP model is
   a) Relationship among all variables is linear
   b) It has single objective function and constraints
   c) Value of decision variables is non-negative
   d) All of the above

3. A feasible solution to an LP problem
   a) Must satisfy all of the problem's constraints simultaneously
   b) Need not satisfy all of the constraints, only some of them
   c) Must be a corner point of the feasible region
   d) Must optimize the value of the objective function

4. For a maximization problem , the objective function coefficient for an artificial variable is
   a) +M
   b) –M
   c) Zero
   d) None of the above

5. A variable which does not appear in the basic variable column of simplex table is
   a) Never equal to zero
   b) Always equal to zero
   c) Called a basic variable
   d) None of the above

6. The dual of the primal maximization LP problem having m constraints and n non-negative variables should
   a) Have n constraints and m non- negative variables
   b) Be a minimization LP problem
   c) Both (a) and (b)
   d) None of the above

7. The first step in Hungarian method is
   a) Prepare Column reduced matrix
   b) Prepare Diagonal matrix
   c) Prepare Row reduced matrix
   d) Prepare Inverse matrix

8. The initial solution of a transportation problem can be obtained by applying any known method . However, the only condition is that
   a) The solution be optimal
   b) The rim conditions are satisfied
   c) The solution not be degenerate
   d) All of the above

9. The solution to a transportation problem with m rows and n columns is feasible if number of positive allocations are
   a) m+n
   b) m*n
   c) m+n-1
   d) m+n+1

10. The size of the payoff matrix of a game can be reduced by using the principle of
    a) Game inversion
    b) Rotation reduction
    c) Dominance
    d) Game transpose

PART - B

Answer any SIX questions **6 x 5 = 30**

11. Find the maximum value of Z=2x+3y
    Subject to
    $2x+y \leq 15$
    $x+3y \leq 20$
    $x \geq 0, y \geq 0$

    Using graphical method.

12. Consider the following 2x2 game.
    G= $\begin{pmatrix} 4 & 7 \\ 6 & 5 \end{pmatrix}$

    a) Does it have a saddle point?
    b) Is it correct to state that the value of the game G will be $5<G<6$
    c) Determine the optimum strategies of the players.

13. Explain the Minimax –Maximin principle.

14. What do you mean by critical path method ? Define critical path and critical activities.

15. Convert the following primal to its dual.

    Max $Z=2x_1+x_2$
    Subject to
    $-x_1+x_2 \leq 4$
    $x_1-x_2 \leq 2$
    $x_1 \geq 0, x_2 \geq 0$

16. Write a short note on Monte Carlo Simulation .

17. Differentiate between transportation and assignment problem.

18. A paper mill produces two grades of paper, X and Y. Because of raw material restrictions, it cannot produce more than 400 tonnes of grade X and 300 tonnes of grade Y in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a tonne of product X and Y respectively with corresponding profits of Rs 200 and Rs 500 per tonne. Formulate this as a LPP to maximize profit and find the optimum profit mix.

PART - C

Answer any THREE questions **3 x 10 = 30**

19. Solve the following LP problem using Simplex Method
    Max $Z=10x_1+6x_2$
    Subject to
    $x_1+x_2 \leq 2$
    $2x_1+x_2 \leq 4$
    $3x_1+8x_2 \leq 12$
    $x_1 \geq 0, x_2 \geq 0$

20. Find the minimum transportation cost from the given problem .

Factory	D1	D2	D3	D4	Supply
F1	3	3	4	1	100
F2	4	2	2	2	125
F3	1	5	3	2	75
Demand	120	80	75	85	300

21. Solve the following game using graphical method

$$\begin{bmatrix} -5 & 2 & -3 & 5 \\ 8 & 7 & 5 & -4 \end{bmatrix}$$

22. The following details are available regarding a project:

Activity	Predecessor Activity	Duration (Weeks)
A	-	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

Determine the critical path, the critical activities and the project completion time.