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0604N125

Candidate's Seat No :_____

B.Sc Semester-6 Examination

CC 310

Statistics

April-2024

Time : 2-30 Hours] **[Max. Marks : 70**

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1. (i) Define general linear programming problem. In context with a linear programming problem define: (i) basic solution, (ii) feasible solution, (iii) basic feasible solution and (iv) optimal solution. (14)

(ii) Solve the following linear programming problem:

$$\begin{aligned} Max\ z = 2x_1 + 4x_2 & \\ \text{s.t. } 2x_1 + 3x_2 &\leq 48 \\ x_1 + 3x_2 &\leq 42 \\ x_1 + x_2 &\leq 21 \\ \text{and } x_1, x_2 &\geq 0 \end{aligned}$$

OR

(i) A company sells two different products A and B. The company makes a profit of Rs. 40 and Rs. 30 per unit on product A and B respectively. The two products are produced in a common production process and are sold in two different markets. The production process has a capacity of 30,000 man hours. It takes 3 hours to produce one unit of A and one hour to produce one unit of B. The market has been surveyed and company officials feel that the maximum number of units of A that can be sold is 8,000 and that of B is 12,000 units. Subject to these limitations, the product can be sold in any convex combination. Formulate as LPP.

(ii) Solve following LPP by graphical method:

$$\begin{aligned} Max\ z = 3x_1 + 9x_2 & \\ \text{s.t. } x_1 + 3x_2 &\leq 60 \\ x_1 + x_2 &\geq 10 \\ x_1 &\leq x_2 \\ \text{and } x_1, x_2 &\geq 0 \end{aligned}$$

2. (i) Explain transportation problem as a particular case of linear programming problem. Explain the least-cost entry method. (14)

(ii) A team of 5 horses and 5 riders has entered a jumping show contest. The number of penalty points to be expected when each rider rides any horse is shown below:

Horses / Machines	R_1	R_2	R_3	R_4	R_5
H_1	5	3	4	7	1
H_2	2	3	7	6	5
H_3	4	1	5	2	4
H_4	6	8	1	2	3
H_5	4	2	5	7	1

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P.T.O

How should the horses be allotted to the riders so as to minimize the expected loss of the team?

OR

(i) Define Assignment Problem. Give the mathematical formulation of Assignment problem.

(ii) Obtain initial basic feasible solution by Vogel's Approximation Method.

Origins \ Store	1	2	3	4	Capacity
A	6	3	5	4	22
B	5	9	2	7	15
C	5	7	8	6	8
Demand	7	12	17	9	45

3. (i) Explain Forward pass and Backward pass Method. (14)

(ii) Determine the critical path, critical activities and the project completion time.

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

OR

(i) Explain the PERT algorithm in detail.

(ii) Explain the difference between CPM and PERT.

4. (i) Define (a) Competitive game, (b) Strategy, (c) Zero-sum game, (d) Two-person Zero-sum game, (e) Payoff matrix. (14)

(ii) Following is the payoff matrix for Player A. Solve the following game:

Player A / Player B	B_1	B_2	B_3
A_1	2	0	3
A_2	3	-1	1
A_3	5	2	-1

OR

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(i) Explain the method for solving a 2×2 two-person zero-sum game without saddle point by algebraic method.

(ii) Two players A and B match coins. If the coins match then A wins Rs. 2, if the coins do not match then B wins Rs. 2. Determine optimum strategies for the players and the value of the game.

5. Attempt any **seven out of twelve**. (14)

(i) State various methods of obtaining the initial basic feasible solution to a transportation problem.

(ii) What is the necessary and sufficient condition for the existence of feasible solution to a transportation problem?

(iii) What is replacement ratio in LPP? What is the role of replacement ratio in Simplex?

(iv) What is the role of $z_j - c_j$ in Simplex method?

(v) How can you solve the assignment problem of maximization type?

(vi) What is the use of CPM?

(vii) Define Slack and Surplus variables.

(viii) What is degenerate and non-degenerate solution for LPP?

(ix) State the necessary and sufficient condition for the existence of feasible solution to a transportation problem.

(x) Explain unbounded solution in Simplex method.

(xi) When we use dominance property in game theory?

(xii) Explain, how you deal with assignment problem with restrictions.

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End of Paper.