Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, December 2023

Course: Operations Research — **Semester: III**

Program: BBA/B.Com/Int.BBA All — **Time: 03 hrs.**

Course Code: DSQT2006 — **Max. Marks: 100**

SECTION A

10Qx2M=20Marks

S. No.		CO
Q1	In an assignment problem, if there were 5 jobs and 5 workers, the number of possible assignments …. (i) 25 solutions (ii) 100 solutions (iii) 120 solutions (iv) 1 solution	CO1
Q2	Constraints in a LPP model represents (i) Limitation (ii) Requirements (iii) Both (i) and (ii) (iv) None of the above	CO1
Q3	The type of decision-making environment is (i) Certainty (ii) Uncertainty (iii) Risk (iv) All of the above	CO1
Q4	In an LPP, to convert $\geq$ inequality constraints into equality constraints, we must (i) use a slack variable (ii) use an artificial variable (iii) use a surplus variable (iv) none of above	CO1
Q5	An optimal solution of an assignment problem can be obtained only if (i) Each row and column have only one zero element (ii) Each row and column have at least one zero element (iii) The data are arrangement in a square matrix (iv) None of the above	CO1
Q6	Which costs can vary with order quantity? (i) Unit cost only (ii) Reorder cost only (iii) Holding cost only (iv) All of these	CO1
Q7	The dummy row or column in a transportation problem is added to (i) satisfy demand and supply conditions	CO1

<table>
<tr><td></td><td>(ii) prevent solution from becoming infeasible
(iii) ensure the total cost does not exceed a limit
(iv) none of the above</td><td></td></tr>
<tr><td>Q8</td><td>In a pure strategy game
(i) Any strategy may be selected arbitrarily.
(ii) A particular strategy is selected by each player.
(iii) Both players select their optimal strategy
(iv) None of the above</td><td>CO1</td></tr>
<tr><td>Q9</td><td>Which is the condition of optimality testing in the simplex method for a minimization of LPP?
(i) All $c_j - Z_j \geq 0$
(ii) All $c_j - Z_j \leq 0$
(iii) Any $c_j - Z_j \geq 0$
(iv) Any $c_j - Z_j \leq 0$</td><td>CO1</td></tr>
<tr><td>Q10</td><td>What happens when maximin and minimax values of the game are same?
(i) No solution exists.
(ii) solution is mixed.
(iii) saddle point exists.
(iv) none of the above</td><td>CO1</td></tr>
<tr><td colspan="3">SECTION B
4Qx5M= 20 Marks</td></tr>
<tr><td>Q11</td><td>What are the essential characteristics of Linear Programming Problem?</td><td>CO2</td></tr>
<tr><td>Q12</td><td>What are the different types of decision-making environments? Provide explanations for each type with a relevant example.</td><td>CO2</td></tr>
<tr><td>Q13</td><td>Define the following terminology in term of replacement theory with suitable example:
i) Purchase cost
ii) Resale cost
iii) Running cost</td><td>CO2</td></tr>
<tr><td>Q14</td><td>A steel company has three open hearth furnaces and five rolling mills. The transportation costs (rupees per quintal) for shipping steel from furnaces to rolling mills are given in the following table.
<table>
<tr><td></td><td>Ma</td><td>M2</td><td>M3</td><td>M4</td><td>M5</td><td>Supply</td></tr>
<tr><td>F1</td><td>4</td><td>2</td><td>3</td><td>2</td><td>6</td><td>8</td></tr>
<tr><td>F2</td><td>5</td><td>4</td><td>5</td><td>2</td><td>1</td><td>12</td></tr>
<tr><td>F3</td><td>6</td><td>5</td><td>4</td><td>7</td><td>7</td><td>14</td></tr>
<tr><td>Demand</td><td>4</td><td>4</td><td>6</td><td>8</td><td>8</td><td></td></tr>
</table>
Find the initial basic feasible solution by Least cost method.</td><td>CO2</td></tr>
<tr><td colspan="3">SECTION-C (attempt any three)
3Qx10M=30 Marks</td></tr>
</table>

Q15 — CO3

A small garment making unit has five tailors stitching five different types of garments. All the five tailors are capable of stitching all the five types of garments. The output per day per tailor for each type of garment are given below:

Tailors	Garments				
	1	2	3	4	5
A	14	27	8	24	24
B	8	27	10	21	32
C	16	15	4	27	32
D	12	15	16	30	40
E	14	24	20	27	36

Which type of garment should be assigned to which tailor in order to maximize profit, assuming that there are no other constraints?

Q16 — CO3

Solve the following game whose payoff matrix is given below. Include in your answer: (i) strategy selection for each player, (ii) the value of the game to each player. Does the game have a saddle point?

Player A	Player B			
	B1	B2	B3	B4
A1	20	15	12	35
A2	25	14	8	10
A3	40	2	10	5
A4	-5	4	11	0

Q17 — CO3

A truck owner finds, from his past records, that the maintenance costs per year of a truck whose purchase price is Rs.8000/- are as given below:

Year	1	2	3	4	5	6	7	8
Maintenance cost	1000	1300	1700	2000	2900	3800	4800	6000
Resale price	4000	2000	1200	600	500	400	400	400

Determine what time would it be profitable to replace the truck.

Q18 — CO3

Analyze the concept of inventory control and illustrate its importance with a specific example.

SECTION-D
2Qx15M= 30 Marks

Q19 — CO4

Let the variable x_1, x_2, x_3 denotes the unit of three types of product A, B and C, respectively, produced by a company and the following LPP shows the objective function and the constraints:

$$max, Z = 22x_1 + 6x_2 + 2x_3$$

Subject to

<table>
<tr><td></td><td>$$7x_1 + 3x_2 + 2x_3 \leq 72$$
$$2x_1 + 4x_2 + x_3 \leq 80$$
$$x_1, x_2, x_3 \geq 0$$
Solve the LPP by simplex method and comment.</td><td></td></tr>
<tr><td>Q20</td><td>The following matrix gives the payoff (in Rs) of different strategies S_1, S_2, S_3 aginst conditions N_1, N_2, N_3 and N_4.
<table>
<tr><td></td><td colspan="4">State of Nature</td></tr>
<tr><td>Strategy</td><td>N1</td><td>N2</td><td>N3</td><td>N4</td></tr>
<tr><td>S1</td><td>4000</td><td>-100</td><td>6000</td><td>18000</td></tr>
<tr><td>S2</td><td>20000</td><td>5000</td><td>400</td><td>0</td></tr>
<tr><td>S3</td><td>20000</td><td>15000</td><td>-2000</td><td>1000</td></tr>
</table>
Indicate the decision taken under the following criterions: (i) maximax (ii) Laplace (iii) Hurwiez ($\alpha = 0.3$)</td><td>CO4</td></tr>
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