Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2022

Course: Operations Research **Semester: III**
Program: BBA All / B.Com.(H) /Int. BBA-MBA **Time : 03 hrs.**
Course Code: DSQT 2006 **Max. Marks: 100**

Instructions:

SECTION A

10Qx2M=20Marks

S. No.		**Marks**	**CO**
1	If a LPP has no feasible region, then we say that LPP has (a) Bounded Solution (b) Unbounded solution (c) No solution (d) None of the above	2	CO1
2	The constraint inequality $4X + 3Y \leq 24$, then the point of intersection (a) (0,8) (6,0) (b) (8,0) (0,6) (c) (0,0) (0,8) (d) (8,0) (0,0)	2	CO1
3	In a zero-sum game, (a) what one player wins, the other loses. (b) the sum of each player's winnings if the game is played many times must be zero. (c) long-run profits must be zero. (d) None of the above	2	CO1
4	In standard form of LPP, the constraint $X + Y - Z = 24$ then Z is said to be (a) Slack variable (b) Surplus variable (c) Artificial variable (d) None	2	CO1
5	The set of values of the decision variables $X_{1,}\, X_{2,}, \dots, X_n$ satisfying the constraints and non-negativity restrictions of the problem is called (a) Optimal solution (b) Feasible solution (c) Bounded solution (d) No solution	2	CO1
6	What happens when maximin and minimax values of the game are same? (a) no solution exists (b) solution is mixed (c) saddle point exists (d) saddle point does not exists	2	CO1

<table>
<tr><td>7</td><td>For finding an initial feasible solution in transportation problem _____________ method is used.
(a) Simplex method
(b) Big-M method
(c) VAM method
(d) Hungerian method</td><td>2</td><td>CO1</td></tr>
<tr><td>8</td><td>Each participant of the game is called-------.
(a) Winner
(b) Looser
(c) Player
(d) None</td><td>2</td><td>CO1</td></tr>
<tr><td>9</td><td>In northwest corner method first allocation is made at
(a) Lower right corner of the table
(b) Upper right corner of the table
(c) Highest costly cell of the table
(d) Upper left-hand corner of the table</td><td>2</td><td>CO1</td></tr>
<tr><td>10</td><td>An assignment problem is considered as a particular case of a
(a) Transportation problem
(b) Game theory
(c) Queuing problem
(d) Sequencing problem</td><td>2</td><td>CO1</td></tr>
<tr><td colspan="4">SECTION B
4Qx5M= 20 Marks</td></tr>
<tr><td>1</td><td>Solve the following LPP by graphical method
$MaxZ = 6X_1 + 8X_2$
$Subject\ to\ constraints$
$5X_1 + 10X_2 \leq 60$
$4X_1 + 4X_2 \leq 40$
$X_1, X_2 \geq 0$</td><td>5</td><td>CO2</td></tr>
<tr><td>2</td><td>Define simulation and list all the steps of simulation.</td><td>5</td><td>CO2</td></tr>
<tr><td>3</td><td>Discuss the objective of inventory control and list the cost associated with inventories.</td><td>5</td><td>CO2</td></tr>
<tr><td>4</td><td>The matrix given below illustrates a game, where competitors A and B are assumed to be equal in ability and intelligence. A has a choice of strategy 1 or strategy 2, while B can select strategy 1 or strategy 2. Find the value of the game and optimum strategy for player A and B.
<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="2">B’s strategy</td></tr>
<tr><td>B1</td><td>B2</td></tr>
<tr><td rowspan="2">A’s strategy</td><td>A1</td><td>4</td><td>6</td></tr>
<tr><td>A2</td><td>3</td><td>5</td></tr>
</table></td><td>5</td><td>CO2</td></tr>
<tr><td colspan="4">SECTION-C
3Qx10M=30 Marks</td></tr>
</table>

1

Suppose an industry is manufacturing two types of products P1 and P2. The profits per Kg of the two products are Rs.30 and Rs.40 respectively. These two products require processing in three types of machines. The following table shows the available machine hours per day and the time required on each machine to produce one Kg of P1 and P2.

Profit/kg	P1	P2	Total availability hours/day
Machine 1	3	2	600
Machine 2	3	5	800
Machine 3	5	6	1100

a. Formulate the problem in the form of linear programming model.
b. Form the dual of the above LPP.

10

CO3

2

Solve the following assignment problem using Hungarian Method. The matrix entries are processing times in hours.

Job	Operator			
	O1	O2	O3	O4
J1	2	10	9	7
J2	15	4	14	8
J3	13	14	16	11
J4	3	15	13	8

10

CO3

3

Explain the following term (a) two-person zero sum game (b) Pure strategy (c) Mixed strategy. Also obtain the value of the game and find the best strategy for player A and B.

	Strategy	Player B			
		B1	B2	B3	B4
	A1	-5	-3	0	4
Player A	A2	5	6	4	8
	A3	4	0	2	-3
	A4	3	0	13	8

10

CO3

SECTION-D
2Qx15M= 30 Marks

4.1

Develop a linear programming problem for the given problem and obtain the optimal solution by Northwest-corner cell method and least cost cell method.

15

CO4

<table>
<tr>
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<table>
<tr><td rowspan="2">Source</td><td colspan="4">Destination</td><td rowspan="2">Supply</td></tr>
<tr><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>I</td><td>3</td><td>1</td><td>7</td><td>4</td><td>300</td></tr>
<tr><td>II</td><td>2</td><td>6</td><td>5</td><td>9</td><td>400</td></tr>
<tr><td>III</td><td>8</td><td>3</td><td>3</td><td>2</td><td>500</td></tr>
<tr><td>Demand</td><td>250</td><td>350</td><td>400</td><td>200</td><td></td></tr>
</table>
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<tr>
<td>4.2</td>
<td>
The marketing department of the company worked out the payoffs in terms of yearly net profits for each of the strategies of three events (expected sales). This is represented in the following table:
<table>
<tr><td rowspan="2">Course of actions</td><td colspan="3">States of nature</td></tr>
<tr><td>N1</td><td>N2</td><td>N3</td></tr>
<tr><td>A1</td><td>6,00,000</td><td>2,00,000</td><td>1,00,000</td></tr>
<tr><td>A2</td><td>4,00,000</td><td>4,50,000</td><td>50,000</td></tr>
<tr><td>A3</td><td>1,50,000</td><td>3,00,000</td><td>3,00,000</td></tr>
</table>
Which strategy should the preferred based on
(a) Maximin criterion (b) Maximax criterion (c) Savage minimax regret criterion (d) Laplace criterion. (e) Hurwicz criterion (Alpha =0.5)
</td>
<td>15</td>
<td>CO4</td>
</tr>
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