Name:
Enrolment No:

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

End Semester Examination – May, 2023

Program: MBA ALL **Semester: II**
Subject/Course: Operations Research **Max. Marks: 100**
Course Code: DSQT7002 **Duration: 3 Hours**

Q. No.	Section A	20	COs
Q1	The strategy that puts the player in the most preferred position irrespective of the strategy of his opponent is called …. a. Pure strategy b. Mixed strategy c. Optimal strategy d. strategy	2	CO1
Q2	Suggest a suitable OR model for deciding the recruitment policy of salesman in a state on the expansion of business. a. Allocation model b. Travelling salesman model c. Inventory model d. Replacement model	2	CO1
Q3	Which of these statements about the stepping-stone method is best? a. A dummy source and destination must be added if the number of rows plus columns minus 1 is not equal to the number of filled squares. b. Only squares containing assigned shipments can be used to trace a path back to an empty square. c. An improvement index that is a net positive means that the initial solution can be improved. d. Only empty squares can be used to trace a path back to a square containing an assigned shipment	2	CO1
Q4	The concept of finding the minimum number of lines crossing all zero is used in a. Steppingstone method b. Hungarian method c. Vogel's method d. MODI method	2	CO1

Q5	Before formulating a formal LPP model, it is better to a. Express each constrain in words b. Express the objective function in words c. Verbally identify decision variables d. All of the above	2	CO1
Q6	In the assignment problem, if a row or a column has all zeros, then: a. The corresponding task or resource cannot be assigned b. The corresponding task or resource must be assigned c. The corresponding task or resource can be assigned with a penalty cost d. None of the above	2	CO1
Q7	The simplex method is used to solve: a. Linear programming problems b. Non-linear programming problems c. Integer programming problems d. Quadratic programming problems	2	CO1
Q8	The objective of Safety Stock is: a. To prevent stockouts due to unexpected increase in demand b. To reduce holding cost c. To reduce ordering cost d. None of the above	2	CO1
Q9	In the graphical method, the feasible region is: a. The area enclosed by the constraints b. The area outside the constraints c. The area where the objective function is maximized d. None of the above	2	CO1
Q10	Operations research is: a. The application of mathematical methods to solve real-world problems b. The study of operations and supply chain management c. The study of production processes in a factory	2	CO1

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<tr><td></td><td>d. The study of logistics and transportation</td><td></td><td></td></tr>
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<tr><td></td><td>Section-B</td><td>20</td><td></td></tr>
<tr><td>Q11</td><td>Discuss main issues involved in LPP.</td><td>5</td><td>CO 2</td></tr>
<tr><td>Q12</td><td>Explain any two of the following:
a. Feasible solution
b. Optimum solution
c. Simulation method
d. Pure strategy of a player</td><td>5</td><td>CO 2</td></tr>
<tr><td>Q13</td><td>Three grades of coal A, B & C contain ash and phosphorus as impurities. In a particular industrial process, a fuel obtained by blending the above grades containing not more than 25% ash and 0.03% phosphorus is required. The maximum demand of the fuel is 100 tons. Percentage impurities and costs of the various grades of coal are shown below. Assuming that there is an unlimited supply of each grade of coal and there is no loss in blending, formulate the blending problem to LPP.
<table><tr><th>Coal Grade</th><th>% ash</th><th>% phosphorus</th><th>Cost per ton (₹)</th></tr><tr><td>A</td><td>30</td><td>0.02</td><td>240</td></tr><tr><td>B</td><td>20</td><td>0.04</td><td>300</td></tr><tr><td>C</td><td>35</td><td>0.03</td><td>280</td></tr></table></td><td>5</td><td>CO 2</td></tr>
<tr><td>Q14</td><td>List any three operation research techniques and state in what conditions they can be used.</td><td>5</td><td>CO 3</td></tr>
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<tr><td>Q. No.</td><td>Section-C
(Attempt any three)</td><td>30</td><td></td></tr>
<tr><td>Q15</td><td>The captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as below:
<table><tr><th rowspan="2">Batsman</th><th colspan="5">Batting Position</th></tr><tr><th>I</th><th>II</th><th>III</th><th>IV</th><th>V</th></tr><tr><td>P</td><td>40</td><td>40</td><td>35</td><td>25</td><td>50</td></tr><tr><td>Q</td><td>42</td><td>30</td><td>16</td><td>25</td><td>27</td></tr><tr><td>R</td><td>50</td><td>48</td><td>40</td><td>60</td><td>50</td></tr></table></td><td>10</td><td>CO 3</td></tr>
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	S	20	19	20	18	25	
	T	58	60	59	55	53	

Find the assignment of batsman to positions which would give the **maximum** number of runs.

Q16

Player A can choose his strategies from (A, B, C) only, while player B can choose from the set (P, Q) only. The rules of the game state that the payments should be made in accordance with the selection of strategies:

Strategy Pair Selected	Payments to be made
A,P	Player A pays Re 1 to player B
A,Q	Player B pays Rs 6 to player A
B,P	Player B pays Rs 2 to player A
B,Q	Player B pays Rs 4 to player A
C,P	Player A pays Rs 2 to player B
C,Q	Player A pays Rs 6 to player B

What strategies should A and B plays in order to get the optimum benefit of the play?

10 | CO 3

Q17

a. What is a replacement model in operations research?
b. The maintenance cost and resale value per year of a machine whose purchase price is ₹7000 is given below:

Year	1	2	3	4	5	6	7	8
Maintenance cost (₹)	900	1200	1600	2100	2800	3700	4700	5900
Resale cost (₹)	4000	2000	1200	600	500	400	400	400

Q18

Dr. Thomas has been thinking about starting his own independent nursing home. The problem is to decide how large the nursing home . Then one returns will depends on both the size of nursing home and a number of marketing factors. After careful analysis Dr. Thomas developed the following table:

Size of nursing home	Good Market (₹ 000')	Fair market (₹ 000')	Poor market (₹ 000')
Small	50	20	-10
Medium	70	35	-25
Large	90	35	-45
Very large	200	25	-120

a. What is the Maximax decision?

10 | CO3

	b. What is the maximin decision? c. What is the Laplace decision? d. What is the Hurwitz decision (take $\alpha = 0.7$)?		
Q. No.	**Section-D** (Attempt any **two**)	30	
Q19	Use simplex method to $$minimize, Z = x_1 - 3x_2 + 2x_3$$ Subject to constraints: $$3x_1 - x_2 + 2x_3 \leq 7$$ $$-2x_1 + 4x_2 \leq 12$$ $$-4x_1 + 3x_2 + 8x_3 \leq 10$$ $$x_1, x_2, x_3 \geq 0$$	15	CO4
Q20	A transportation problem with following costs of transportation from 3 supply location to 4 demand location as: $c_{11} = 2$ $c_{12} = 3$ $c_{13} = 11$ $c_{14} = 7$ $c_{21} = 1$ $c_{22} = 0$ $c_{23} = 6$ $c_{24} = 1$ $c_{31} = 5$ $c_{32} = 8$ $c_{33} = 15$ $c_{34} = 9$ Suppose the following allocations are being made as initial feasible solution: $x_{11} = 1, x_{12} = 5, x_{24} = 1, x_{31} = 6, x_{33} = 3, x_{34} = 1$. Test the optimality of the given solution using MODI method.	15	CO4
Q21	A manufacturer is to make a choice between two machines, say, A and B, which are priced at Rs. 50,000 and Rs. 25,000 respectively. The annual running costs for machine A are Rs. 8,000 for the first five years after which the costs increase per year by Rs. 2,000. Machine B, which has the same capacity as machine A, will have a running cost of Rs. 12,000 for the first six years, and after that would increase by Rs. 2,000 per year. If the money is worth 10% per year, which machine should be purchased? Assume that the scrap value of the two machines is nil.		