UNIVERSITY OF PETROLEUM & ENERGY STUDIES
End-Term Examination – May, 2025

Program: BBA-Digital Business   **Semester: IV**
Course: Operations Research   **Max. Marks: 100**
Course Code: DSQT2006   **Duration: 3 Hours**

Q. No.	Section A (2x10=20marks)	20	COs
Q1	In the context of an assignment problem, what values can the decision variables assume? a. Any real numbers b. Only integers c. Only binary values (0 or 1) d. Any non-negative numbers	2	CO1
Q2	If, in a simplex tableau, all the entries in the pivot (ratio) column are less than or equal to zero, what can be concluded about the solution to the linear programming problem (LPP)? a. Optimal b. Bounded c. Unbounded d. Infeasible	2	CO1
Q3	Which of the following best describes the field of Operations Research? a. The use of mathematical techniques to analyze and optimize complex decision-making problems b. A branch of study focused solely on supply chain and operations management c. An analysis of manufacturing processes within industrial settings d. A discipline concerned exclusively with logistics and transportation systems	2	CO1
Q4	The technique of covering all zeros using the minimum number of lines is a key step in which of the following methods? a. Simplex method b. Vogel's approximation method c. Hungarian method d. North-West corner rule…	2	CO1
Q5	Which of the following conditions must be satisfied to obtain an optimal solution to an assignment problem? a. Each row and column contains exactly one zero b. Each row and column contain at least one zero c. The cost matrix is a square matrix d. None of the above	2	CO1
Q6	In an assignment problem, what does it indicate if an entire row or column in the cost matrix contains only zeros? a. The associated job or agent cannot be assigned b. The associated job or agent must be assigned	2	CO1

	c. The assignment will incur a penalty cost d. None of the above		
Q7	If the number of allocations in a basic feasible solution is less than $(m + n - 1)$, the solution is: a. Optimal b. Infeasible c. Degenerate d. Unbounded	2	CO1
Q8	What is the primary purpose of maintaining safety stock in inventory management? a. To prevent stockouts caused by unforeseen demand fluctuations b. To minimize storage costs c. To lower the cost of placing orders d. None of the above	2	CO1

Q9	In the graphical method, the feasible region is:
	   a. the area outside the constraints
	   b. the area where the objective function is maximized.
	   c. the area enclosed by the constraints.
	   d. None of the above
		2	CO1

Q10	Which of the following methods is used to find an initial basic feasible solution for a transportation problem? a. Simplex Method b. Vogel's Approximation Method c. Hungarian Method d. Dual Simplex Method	2	CO1
	Section-B **(5x4=20marks)**	20	
Q11	How is the assignment problem considered as a special case of the transportation problem? Explain.	5	CO2
Q12	Solve the LP problem using graphical methods: $$maximize\ Z = 3x_1 + 4x_2$$ Subject to $$5x_1 + 4x_2 \leq 200$$ $$3x_1 + 5x_2 \leq 150$$ $$x_1, x_2 \geq 0$$	5	CO2
Q13	A company distributes goods from four different warehouses (W1, W2, W3, W4) to three retail stores (S1, S2, S3). The company needs to determine the most cost-effective way to transport	5	CO2

goods to meet the demands of each store. The transportation costs (in dollars) between each warehouse and retail store, along with the available supply at each warehouse and the required demand at each store, are given below.

		To			Supply
		S1	S2	S3	
From	W1	3	8	5	5
	W2	5	5	3	8
	W3	7	6	9	7
	W4	4	9	5	14
Demand		7	9	18	

The company wants to find the initial basic feasible solution to this transportation problem using the Least Cost Method to minimize the transportation cost. Please help the company for 5 marks!

Q14	Discuss the various types of decision-making environment.	5	CO2
Q. No.	**Section-C** (10x3=30marks)	30	CO
Q15	A salesman wants to visit cities 1, 2, 3 and 4. He does not want to visit any city twice before completing the tour of all the cities and wishes to return to his home city, the starting station. The cost of going from one city to another in rupees is given below. Suggest the least cost route to the salesman. To city 	10	CO3

		1	2	3	4
From city	1	0	30	80	50
	2	40	0	140	30
	3	40	50	0	20
	4	70	80	130	0

Q16	Explain the use of payoff table in decision making. In a coin-matching game of two players, Player A receives ₹2 when both coins show heads, earns nothing when both coins show tails, and loses ₹1 when one-coin shows heads and the other shows tails. Construct the payoff matrix for player A and determine the value of the game.	10	CO3
Q17	The research department of ABC company has recommended the marketing department launch a sample of three different types of shampoo. The marketing manager has to decide on one of the type of sample to be launched under the following estimated payoff for various level of sales are given below. What will the marketing manager's decision be if (i) Maximin (ii) Minimax (iii) Maximax regret (iv) Laplace (v) Hurwitz (with $\alpha = 0.3$) is applied?	10	CO3

Type of shampoo	Estimated levels of sales		
	15,000	10,000	5,000
Egg shampoo	30	10	10
Clinic shampoo	40	15	5
Deluxe shampoo	55	20	3

Q. No.	Section-D (15x2=30marks)	30	CO
Q18	Solve the following LP problem by simplex method: $$maximize, Z = 12x_1 + 15x_2 + 14x_3$$ Subject to $$-x_1 + x_2 \leq 0$$ $$-x_2 + 2x_3 \leq 0$$ $$x_1 + x_2 + x_3 \leq 100$$ $$x_1, x_2, x_3 \geq 0$$ Give your comment about the obtained solution.	15	CO4
Q19	The maintenance cost and resale value per year of a machine whose purchasing price is ₹7000/- is given below: 	Year	1	2	3	4	5	6	7	8
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Maintenance cost (₹)	900	1200	1600	2100	2800	3700	4700	5900
Resale cost (₹)	4000	2000	1200	600	500	400	400	400 | When should the machine be replaced?	15	CO4