

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

	(Level/CO)	Marks
Q. 1 Solve Any Two of the following.		12
A) Describe the fundamental principles of calculus and how they relate to mathematical optimization.	Understand/ CO1	6
B) How to calculate the order of convergence for an iterative method?	Understand/ CO1	6
C) What are the advantages and disadvantages of using stochastic methods?	Understand/ CO1	6
Q.2 Solve Any Two of the following.		12
A) What are some applications of multi-objective optimization?	Understand/ CO2	6
B) Write the Kuhn- Tucker conditions for the following minimization problem $\text{Min } f(x) = x_1^2 + x_2^2 + x_3^3, g_1(x) = 2x_1 + x_2 \leq 5, g_2(x) = x_1 + x_3 \leq 2, g_3(x) = -x_1 \leq 1, g_4(x) = -x_2 \leq -2, g_5(x) = -x_3 \leq 0$	Apply /CO2	6
C) Explain the concept of Penalty Method Optimization Techniques in the context of constrained optimization problems. Describe how Penalty Methods work to convert constrained problems into unconstrained ones. Provide an example of a constrained optimization problem	Understand/ CO2	6
Q. 3 Solve Any Two of the following.		12
A) Niki holds two part-time jobs, Job I and Job II. She never wants to work more than a total of 12 hours per week. She has determined that for every hour she works at Job I, she needs 2 hours of preparation time, and for every hour she works at Job II, she needs one hour of preparation time, and she cannot spend more than 16 hours for preparation. If she makes \$40 an hour at Job I and \$30 an hour at Job II, how many hours should she work per week at each job to maximize her income?	Apply/CO3	6
B) Explain Interior-Point Method for LP Integer Programming.	Understand/ CO3	6

C) Discuss Principal Component Analysis.	Understand/ CO3	6
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Q.4 Solve Any Two of the following. 12

A) Demonstrate use of Data Mining for Big Data.	Understand/ CO4	6
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B) Describe Basic Queueing Model.	Understand/ CO4	6
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C) Explain Pareto Front and Pareto Optimality.	Understand/ CO4	6
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Q.5 Solve Any Two of the following. 12

A) Demonstrate Firefly Algorithm with suitable example.	Understand/ CO5	6
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B) Explain Ant and Bee Algorithms.	Understand/ CO5	6
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C) Discuss Flower Pollination Algorithm.	Understand/ CO5	6
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