Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– VI EXAMINATION – SUMMER 2026

Subject Code:3164303 Date:22-05-2026

Subject Name: Nature Inspired Optimization Algorithms

Time: 10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1*	**(a)**	What is nature-based optimization, and how does it differ from traditional optimization techniques?	**03**
	(b)	Classify optimization algorithms based on their approach and characteristics.	**04**
	(c)	List out different types of optimization.	**07**
Q.2	**(a)**	Describe the working principle of Genetic Algorithm (GA) in nature-based optimization.	**03**
	(b)	What are bio-inspired algorithms? Provide examples of algorithms inspired by biological systems.	**04**
	(c)	Define swarm intelligence and describe its underlying principles. Provide examples of applications in optimization problems.	**07**
		OR	
	(c)	How do the concepts of selection, crossover, and mutation apply to solving the Traveling Salesman Problem? Discuss the advantages and limitations of using Genetic Algorithms for solving the Traveling Salesman Problem.	**07**
Q.3	**(a)**	Compare the Simplex and Revised Simplex methods in terms of their advantages and disadvantages.	**03**
	(b)	Define stochastic programming and what are key components of Stochastic programming model?	**04**
	(c)	Explain how Ant Colony Optimization can be applied to solve the Traveling Salesman Problem (TSP). Discuss the steps and considerations involved in the implementation.	**07**
		OR	
Q.3	**(a)**	Define integer programming and list out its types.	**03**
	(b)	Provide a simple example of a linear programming problem and demonstrate how to solve it using the Simplex Method.	**04**
	(c)	Define Cuckoo Search algorithm. Explain how the Cuckoo Search Optimization Algorithm can be applied to solve a real-world optimization problem. Provide an example and detail the implementation process.	**07**
Q.4	**(a)**	Outline the basic steps of the Particle Swarm Optimization algorithm.	**03**
	(b)	What is Ant Colony Optimization (ACO)? Describe its primary mechanism.	**04**
	(c)	Define binary cuckoo search algorithm. Explain it in detail.	**07**
		OR	

Q.4	**(a)**	What are the key characteristics of ants that make them suitable for optimization problems?	**03**
	(b)	Discuss the advantages and disadvantages of Fish School Search Optimization.	**04**
	(c)	Explain crow search algorithm in detail.	**07**
Q.5	**(a)**	What are the key features of the Discrete Cuckoo Algorithm?	**03**
	(b)	What is the Network Routing Problem, and why is it critical in telecommunications and computer networks?	**04**
	(c)	Explain Bat algorithm in detail. Compare it with firefly algorithm.	**07**
		OR	
Q.5	**(a)**	Outline steps involved in flower pollination algorithm.	**03**
	(b)	Discuss the advantages and limitations of using the Firefly Algorithm for optimization tasks.	**04**
	(c)	Describe the role of heuristic and metaheuristic approaches in solving combinatorial optimization problems, particularly the TSP and Job Scheduling Problem.	**07**

***It is advisable to put fundamental questions of respective subject in Q1, as it is compulsory question.**

****