U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**

Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**

Course Code: 24AM5PCNIC **Max Marks: 100**

Course: NATURE INSPIRED COMPUTING

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

RAPPER EXAMS 2024-25

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Illustrate the three branches of Nature-to-Nature Computing with a brief explanation of each.	CO2	PO2	**07**
	b)	Analyze how adaptation and feedback contribute to self-organization in computational systems.	CO3	PO2	**07**
	c)	Compare and contrast parallelism and distributive in Nature-to-Nature Computing with suitable examples.	CO3	PO2	**06**
		OR			
2	a)	Critically examine the philosophy underlying Nature-to-Nature Computing and its impact on modern computational paradigms.	CO3	PO2	**07**
	b)	Explain with examples how self-organization leads to improved system performance in complex computing systems.	CO1	PO1	**06**
	c)	Propose a framework to study the emergence of new patterns in distributed systems using Nature-to-Nature Computing principles.	CO1	PO1	**07**
		UNIT - II			
3	a)	Describe the working principles of Ant Colony Optimization (ACO) with an example.	CO1	PO1	**07**
	b)	Illustrate the working mechanism of Bee Colony Optimization (BCO).	CO1	PO1	**06**
	c)	Illustrate the steps involved in Particle Swarm Optimization (PSO) and highlight its unique features.	CO3	PO2	**07**
		OR			
4	a)	Evaluate the efficiency of Ant Colony Optimization (ACO) in	CO3	PO2	**07**

			solving routing problems compared to traditional optimization techniques.			
		b)	Propose a framework for implementing Swarm Intelligence algorithms in large-scale distributed systems.	*CO2*	*PO3*	**07**
		c)	Critically examine the limitations of Bee Colony Optimization and suggest possible improvements.	*CO3*	*PO2*	**06**
			UNIT - III			
	5	a)	Explain the significance of encoding in Genetic Algorithms (GA) and analyze how different encoding methods impact its performance. Provide examples.	*CO3*	*PO1*	**07**
		b)	Elaborate on the various types of Genetic Algorithms, providing an example for each.	*CO2*	*PO3*	**06**
		c)	Design a Genetic Algorithms flow for solving a complex optimization problem, including appropriate stopping conditions. Describe your approach in detail.	*CO3*	*PO2*	**07**
			OR			
	6	a)	Analyze how selection operators influence convergence speed and solution quality in Genetic Algorithms. Suggest improvements for better performance.	*CO2*	*PO3*	**07**
		b)	Propose a novel hybrid Genetic Algorithm model by integrating adaptive techniques and parallel processing. Discuss the potential benefits and challenges.	*CO3*	*PO2*	**07**
		c)	Develop a framework to classify and compare Genetic Algorithms based on their adaptability to dynamic environments.	*CO3*	*PO2*	**06**
			UNIT - IV			
	7	a)	Explain the working principle of the Firefly Algorithm and describe how it mimics the behavior of fireflies in nature.	*CO2*	*PO3*	**10**
		b)	Compare and contrast the Cuckoo Search algorithm with the Harmony Search algorithm in terms of their inspiration and optimization approach.	*CO3*	*PO2*	**10**
			OR			
	8	a)	Apply the Social Spider Algorithm to solve a traveling salesman problem (TSP) for a 5-city route. Provide intermediate steps for clarity.	*CO2*	*PO3*	**10**
		b)	Critically evaluate the efficiency of the Intelligent Water Drops Algorithm in handling multi-objective optimization problems.	*CO3*	*PO2*	**10**
			UNIT - V			
	9	a)	Compare the Dragonfly Optimization Algorithm with the Whale	*CO2*	*PO3*	**10**

REAPPEAR EXAMS 2024-25

			Optimization Algorithm in terms of their biological inspiration and application scope.			
		b)	Evaluate the performance of the Beam Search Algorithm in solving combinatorial optimization problems compared to heuristic algorithm Grey Wolf Optimization.	*CO3*	*PO2*	**10**
			OR			
	10	a)	Design a hybrid optimization algorithm that combines features from Dragonfly Optimization and Beam Search. Explain the workflow and provide pseudo code.	*CO2*	*PO3*	**10**
		b)	Discuss the advantages and limitations of the Dragonfly Optimization Algorithm for real-time dynamic optimization problems.	*CO3*	*PO2*	**10**

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