B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024
Fourth Semester
Computer Science and Engineering (AIML)
20AMPC401 - NATURE INSPIRED COMPUTING TECHNIQUES
Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

	Marks	K-Level	CO
1. List out the types of agents.	2	K1	CO1
2. Recall Nature Computing.	2	K1	CO1
3. What role does crossover play in genetic algorithms?	2	K1	CO2
4. List the advantages of evolutionary computing.	2	K1	CO2
5. List two examples of optimization problems that can be solved using ant colony optimization (ACO) algorithms.	2	K1	CO3
6. Define Swarm Robotics.	2	K1	CO3
7. State Danger Theory.	2	K2	CO5
8. Write about artificial immune systems (AIS).	2	K2	CO5
9. List the key structural features of DNA molecules.	2	K1	CO6
10. Infer DNA computing.	2	K2	CO6

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

			Marks	K-Level	CO
11.	a)	Enumerate the conceptual difference between experiment, simulation, realization and emulation.	13	K2	CO1
		OR			
	b)	What is self-organization? List out its characteristics and discuss the advantages and disadvantages of self organization over its alternatives.	13	K2	CO1
12.	a) i)	Infer Simulated Annealing with example.	7	K2	CO2
	ii)	Examine Hill Climbing search in detail.	6	K2	CO2
		OR			
	b) i)	Analyze in detail about genetic algorithm with example.	7	K2	CO2
	ii)	Compare and contrast evolutionary programming and genetic programming.	6	K2	CO2
13.	a) i)	Outline foraging for food and clustering of objects.	6	K2	CO3
	ii)	Explain in detail about SACO algorithm with example.	7	K2	CO3

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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b) Enumerate the number of global maximum and global minimum for the given function: $y = f(x) = \sin x + \sin x^2 + \sin x \cos x$ for $-6 \geq x \leq +6$ with an incremental value of 0.2.   *13 K3 CO3*

14. a) Detail exploration and exploitation with respect to the inertia term, Diversification and Intensification terms, personal and social influence.   *13 K2 CO4*

OR

b) i) Discuss the applications of PSO.   *6 K2 CO4*

ii) Explain briefly how particle swarm optimization (PSO) works.   *7 K2 CO4*

15. a) Explain the principles of the Polymerase-based Adleman Model (PAM) in DNA computing. How does it simulate computation using DNA molecules?   *13 K2 CO6*

OR

b) Explain Richard J. Lipton's solution to the Boolean satisfiability problem (SAT) using DNA computing. How does his approach leverage DNA molecules to solve NP-complete problems?   *13 K2 CO6*

PART - C (1 × 15 = 15 Marks)

16. a) i) Describe the physiology and main components of the immune system.   *8 K2 CO5*

ii) Explain in detail about the pattern recognition and binding.   *7 K2 CO5*

OR

b) i) Discuss about the adaptive Immune Response.   *8 K2 CO5*

ii) Detail on the bone marrow models.   *7 K2 CO5*