Question Paper

Exam Date & Time: 10-Jan-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B.TECH MAKEUP EXAMINATIONS, JAN 2024

Natural Computing [ICT 4051]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions. Section Duration: 180 mins

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)		Critically evaluate the polymerase chain reaction (PCR) process. Delve into its underlying mechanism, describe the steps involved in conducting PCR, and assess the objectives and applications of this molecular biology technique.	(5)
	A)		
	B)	Investigate the structure of a simple Genetic Algorithm (GA) by analyzing the roles and impacts of its three fundamental genetic operators: reproduction, crossover, and mutation.	(3)
	C)	Mention and elaborate any two advantages and applications of Evolutionary Computation.	(2)
2)		Obtain a PDA to accept the language L = $\{a^n b^{2n} \mid n>=1\}$	(5)
	A)		
	B)	Analyze the operations performed on DNA by providing a specific example.	(3)
	C)	Examine the differences and similarities between the global and local versions of the Particle Swarm Optimization (PSO) algorithm.	(2)
3)		Evaluate the application of Ant Colony Optimization (ACO) in solving the Traveling Salesman Problem (TSP). Discuss how ACO mimics natural ant behavior to find the most efficient route, and analyze its effectiveness and challenges in addressing TSP's complexities.	(5)
	A)		
	B)	Outline the process for transforming a Context-Free Grammar (CFG) into a Pushdown Automaton (PDA).	(3)
	C)	Obtain grammar to generate string consisting of any number of a's and b's. Also, write the language generated by the above grammar.	(2)
4)		Draw a DFA to accept set of all strings on the alphabet Σ = {0,1} that either begins or ends or both with substring 01.	(5)
	A)		
	B)	What are the three reasons for using DNA computing to solve computational problems?	(3)
	C)	Enumerate the different Search Termination (Stopping Criteria) conditions utilized in Genetic Algorithms (GA), emphasizing how these conditions determine when a GA should halt its search process.	(2)
5)		Categorize grammars based on the Chomsky hierarchy, and provide illustrative examples for each	(5)

grammar classification.

A)

B) Enumerate the various encoding mechanisms utilized in Genetic Algorithms, highlighting their distinct approaches to representing solutions and their respective impacts on algorithmic performance. (3)

C) Discuss the primary characteristics of peptide computing, emphasizing its unique qualities and the impact these have on its functionality in computational scenarios. (2)

-----End-----