APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY

08 PALAKKAD CLUSTER

Q. P. Code : CSE0821232-I (Pages: 3)

Name: .....

Reg. No: .....

SECOND SEMESTER M.TECH. DEGREE EXAMINATION JULY 2021

Branch: Computer Science and Engineering Specialization: Computer Science and Engineering

08CS6032 EVOLUTIONARY COMPUTING

(Common to CSE)

Time: 2 hour 15 minutes **Max. Marks: 60**

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q. No.	Module 1	Marks
1. a	EC systems search probabilistically for good solutions. What advantages you see in using probabilistic algorithms over deterministic algorithms for solving complex search problems?	3
	Answer b or c	
b	Represent, using pseudo code, the Evolutionary Algorithm. Discuss the main components used to solve an EA.	6
c	Differentiate Genetic algorithm and Genetic programming	6

Q. No.	Module 2	Marks
2. a	What is the main difference(s) between simulated annealing and hill climbing?	3
	Answer b or c	
b	Generate a heuristic function to solve the following problem using hill climbing technique:	6

2	8	3
1	6	4
7		5

should be changed to

1	2	3
8		4
7	6	5

c The following table shows evaluations of a simulated annealing algorithm. For each evaluation give the probability of the next state being accepted. Assume the objective function is being maximised. Discuss the results. 6

No.	Current State (Evaluation)	Potential New State (Evaluation)	Temperature
1	120	50	20
2	120	50	500
3	120	100	20
4	120	100	500
7	120	150	20
8	120	150	500

Q. No. **Module 3** **Marks**

3. a One-Point Crossover is not suitable for The Travelling Salesman Problem (TSP). Why is this? 3

Answer b or c

b Suppose a genetic algorithm uses chromosomes of the form x = a b c d e f g h with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: 6

f(x) = (a + b) − (c + d) + (e + f) − (g + h), and let the initial population consist of four individuals with the following chromosomes:

x1 = 6 5 4 1 3 5 3 2

x2 = 8 7 1 2 6 6 0 1

x3 = 2 3 9 2 1 2 8 5

x4 = 4 1 8 5 2 0 9 4

Evaluate the fitness of each individual, and arrange them in order with the fittest first and the least fit last.

Perform the following crossover operations:

i) Cross the fittest two individuals using one–point crossover at the middle point.

ii) Cross the second and third fittest individuals using a two–point crossover (points b and f).

c Name and describe the main features of Genetic Algorithms 6

Q. No.	Module 4	Marks
4. a	Explain path retracing done in ACO and discuss its relevance.	3
	Answer b or c	
b	Using the travelling salesman problem as an example, define the following terms with relation to ant algorithms Visibility Evaporation Transition Probability	6
c	Explain any three variants of ACO algorithm	6

Q. No.	Module 5	Marks
5. a	What is the initialization step of the Particle Swarm Optimization method?	4
	Answer b or c	
b	How are the velocity and position of particles updated? Explain in detail with the pseudo code	8
c	Describe the neighbourhood topologies used in Particle Swarm Optimization	8

Q. No.	Module 6	Marks
6. a	Differentiate abc_{gbest} and $abc_{gbestdist}$ algorithms	4
	Answer b or c	
b	Explain Artificial Bee Colony algorithm and its working in detail. Write the criteria for selecting and abandoning a food source by bees.	8
c	Suggest a method for solving any NP problem with ABC algorithm. Explain with example based on fitness of each and every next generation.	8