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Code No. : 15654 H

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (I.T. : Honours) V-Semester Main Examinations, Jan./Feb.-2024

Computational Intelligence

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	List all the computational intelligence paradigms using a neat diagram.	2	1	1	1
2.	Distinguish between Random Selection and Elitism selection operators.	2	2	1	1
3.	Define Multi-Objective Optimization.	2	1	2	1
4.	Explain one-point crossover and two-point crossover with example.	2	2	2	1
5.	What are the two types of search spaces used by Cultural Evolution?	2	1	3	1
6.	Name the categories and sub categories of Coevolution Types.	2	1	3	1
7.	Enumerate key characteristics of metaheuristic algorithms.	2	1	4	1
8.	What role does the velocity vector play in changing the position of the particle in PSO?	2	2	4	1
9.	List types of membership functions with diagrams.	2	1	5	1
10.	How is crisp set different from fuzzy set? Give an example.	2	2	5	1
Part-B (5 × 8 = 40 Marks)					
11. a)	Differentiate between Selection and Mutation genetic operations.	4	2	1	1
b)	Justify, why fitness function plays an important role in Evolutionary Computing?	4	3	1	1
12. a)	Consider the expression, (x1 AND NOT x2) OR (NOT x1 AND x2). For this problem, define function set, and the terminal set and draw the tree representation.	4	3	2	1
b)	Which data structure is commonly used for genetic programming and why?	4	1	2	1
13. a)	Build the steps (pseudocode) to show how Evolution Strategy Algorithm works.	4	3	3	2
b)	Which strategy of differential evolution DE/x/y/z maintains good diversity?	4	3	3	2

14. a)	What justification can be given to the ability of birds to fly synchronously, and to suddenly change direction with a regrouping in an optimal formation?	4	3	4	2
b)	Compare and contrast star and ring social network structures of PSO.	4	2	4	1
15. a)	What are the various defuzzification methods? Which is the most commonly used method?	4	2	5	1
b)	(i) Compute algebraic sum of two fuzzy sets $A(x) = \{(x1,0.3), (x2,0.2), (x3,0.3), (x4,0.4)\}$ $B(x) = \{(x1,0.5), (x2,0.6), (x3,0.8), (x4,0.9)\}$	4	4	5	2
	(ii) Compute algebraic product of $A(x).B(x)$ $A(x) = \{(x1,0.1), (x2,0.3), (x3,0.3), (x4,0.4)\}$ $B(x) = \{(x1,0.5), (x2,0.7), (x3,0.6), (x4,0.9)\}$				
16. a)	Which is more suitable and why – binary versus gray code representation of the chromosome?	4	2	1	1
b)	Create new tree to represent a mathematical or boolean equation in genetic programming. Show the resultant tree when a) the tree grows, b) argument swaps, c) the tree gets truncated. Mark the area where changes have been introduced.	4	3	2	2
17.	Answer any <i>two</i> of the following:				
a)	Role of Difference vectors to determine the mutation step size.	4	3	3	1
b)	Compare and Contrast Global Best PSO and Local Best PSO algorithms.	4	3	4	1
c)	Apply the concept of fuzzification to a specific control scenario, such as temperature regulation in a room and demonstrate how crisp inputs are converted into fuzzy sets and describe the process of mapping numerical values to linguistic terms.	4	4	5	2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	30%
iii)	Blooms Taxonomy Level – 3 & 4	50%
