KUMARAGURU college of technology
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Register Number:……..…

M.E DEGREE EXAMINATIONS: DEC 2015

(Regulation 2014)

Third Semester

COMMUNICATION SYSTEMS

P14AETE23: Soft Computing

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. What is the usual sequence of events for optimizing a minimization problem using Genetic algorithm? CO3 [K_2]

   (1) Mutation (2) Selection (3) Cross over (4) Elitism

   a) 1-2-3-4 b) 2-3-4-1

   c) 2-3-1-4 d) 3-4-1-2

2. Which of the following 2 input Boolean logic functions are linearly inseparable (i) AND, (ii) OR, (iii) XOR, (iv) NAND, (v) XNOR. CO2 [K_2]

   a) (i),(ii) b) (iii), (v)

   c) (iii),(iv) d) (ii),(iv)

3. In simulated annealing _____ specifies the probability density function of the difference between current point and the next point to be visited. CO1 [K_2]

   a) Objective function b) Generative function

   c) Acceptance function d) Annealing schedule

4. Match the following optimization methods in list I & their basic procedures in list II CO1 [K_2]

List I	List II
A. Genetic Algorithm	i. Random exploration of parameter space
B. Simulated Annealing	ii. Reflection & expansion
C. Random Search	iii. Cooling schedule
D. Downhill Search	iv. Generation cycle

a) 2 1 4 3 b) 1 2 3 4

c) 3 2 1 4 d) 4 3 1 2

5. Clustering methods fall under_____ algorithms. CO5 [K_2]

a) Supervised b) Unsupervised

c) Random search d) Evolutionary

6. A Hopfield network is a _____ memory. CO2 [K_2]

a) Heteriassociative b) Autoassociative

c) Iterativeassociative d) Not an associative

7. The following items consists of two statements, one labeled as the "Assertion (A)" and CO5 [K_2]

the other as "Reason (R). You are to examine those two statements carefully and select

the answers to these items using the codes given below:

Assertion (A): Mamdani's systems were used as controllers to generate the heat in the boiler and throttle opening of the cylinder, respectively, to regulate the steam pressure and the speed of the engine.

Reason (R) : Defuzzification is required to convert the fuzzy set into crisp input values .

a) both A and R are individually true and R has relationship with A

b) both A and R are individually true and R has no relationship with A

c) A is true but R is false

d) A is false but R is true.

8. Copying a small proportion of the fittest candidates, unchanged, into the next generation is known as CO3 [K_2]

a) Reproduction b) Regeneration

c) Mutation d) Elitism

9. Which of the following is not an application of a traveling salesman problem? CO1 [K_2]

i)Manufacture of microchips ii) arranging school bus routes iii) Job

scheduling (iv)Manufacturing of measuring devices

a) (i), (ii), and (iv) b) (ii) and (iii)

c) (i) and (iv) d) (iv)

10. Number of elements in the universe of discourse is called _____. CO4 [K_1]

a) Core b) Support

c) Cardinality d) Excluded middle

PART B (10 x 2 = 20 Marks)

11. What are the advantages of neural networks over conventional computers? CO2 [K_2]
12. How do you identify a winner in topology preserving maps? CO2 [K_1]
13. Identify some differentiable parameterized membership functions. CO4 [K_1]
14. State the advantages of fuzzy set over crisp set. CO4 [K_2]
15. What is fuzzy inference system? Draw its block diagram. CO5 [K_2]
16. Explain the curse of dimensionality in grid partitioning. CO5 [K_2]
17. Compare Derivative and Derivative free optimization techniques. CO1 [K_2]
18. Mention the sequence of steps followed in K-means clustering algorithm. CO1 [K_2]
19. Distinguish between cross over and mutation. CO3 [K_2]
20. Define Generation cycle. CO3 [K_1]

PART C (6 x 5 = 30 Marks)

21. Analyze the Hebb net for solving AND problem if inputs and targets are represented in binary and bipolar forms respectively. CO2 [K_4]

22. Explain linearly and nonlinearly separable problems with appropriate examples. CO2 [K_2]

23. To compare two sensors based upon their detection levels and gains with a universe of discourse of gain settings, X = {0,20, 40, 60, 80, 100}, the sensor detection levels for the monitoring of a standard items provides typical membership functions to represent the detection levels for each sensors are given below. CO4 [K_4]

$$S_1 = \left\{\frac{0}{0} + \frac{0.5}{20} + \frac{0.65}{40} + \frac{0.85}{60} + \frac{1.0}{80} + \frac{1.0}{100}\right\}$$

$$S_2 = \left\{\frac{0}{0} + \frac{0.45}{20} + \frac{0.6}{40} + \frac{0.8}{60} + \frac{0.95}{80} + \frac{1.0}{100}\right\}$$

Find the membership functions i) $\mu_{S_1 \cup S2}(x)$ ii) $\mu_{S_1 \cap S2}(x)$ iii) $\mu_{\overline{S_1}}(x)$

24. Explain the cross over and mutation processes in GA with appropriate examples. CO3 [K_2]

25. Outline the Steepest descent method for optimization. CO1 [K_1]

26. Compare Mamdani, Sugeno and Tsukamoto models in fuzzy inference systems. CO5 [K_2]

PART D (4 x 10 = 40 Marks)

27. State and prove Perceptron rule convergence theorem. CO2 [K_3]

28. Discuss in detail the steps involved in Kmeans clustering. Suppose we have 4 medicines, each has two features X = pH and Y = weight index. Group the 4 medicines into 2 groups by Kmeans clustering based on the features X and Y. CO5 [K_3]

29. Apply Roulette Wheel selection to find the fittest individuals transferred to the second generation for maximizing the function x^2 for the input range of x is {1,2,3,…….,31}. CO3 [K_3]

30. Construct a Kohonen Self Organizing map to cluster the four given vectors, [0 01 1], [1 0 0 0], [0 1 1 0] and [0 0 0 1] .The number of clusters to be formed is 2 and initial learning rate is 0.5. CO5 [K_2]

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