

ASSIGNMENT SET – I**Mathematics: Semester-IV****M.Sc (CBCS)****Department of Mathematics****Mugberia Gangadhar Mahavidyalaya****PAPER - MTM-403****Paper: Soft Computing****Answer all the questions**

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| 1 | <p>a. What is activation function? Mention two such activation function in neural network.</p> <p>b. What are the basic parameters of involved in Genetic Algorithm (GA)?</p> <p>c. What are the disadvantages of binary coded Genetic Algorithm?</p> <p>d. What do you mean by supervised and unsupervised learning?</p> <p>e. Write down the features of soft computing.</p> <p>f. Mention the ranges of different GA parameters.</p> <p>g. Define Tautology and Contradiction. Obtain a truth table for $(P \cup Q) \Rightarrow (\sim P)$. Is it Tautology?</p> <p>h. What do you mean by Inference in propositional logic?</p> <p>i. Describe uniform crossover in GA.</p> | <p>Each question carries 2 marks</p> |
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| 2 | <p>a. Draw a flow chart of Genetic Algorithm.</p> <p>b. Select the parent chromosomes for crossover using Roulette wheel selection procedure for the following information. Objective function: $\text{Max } f(x) = 50x - x^2, 1 \leq x \leq 30$, Current population: 01011, 10011, 01110, 01010, 01101 Random numbers: 0.41, 0.97, 0.12, 0.36, 0.64</p> <p>c. Find the relational matrix of the concept “a young tall man”, where “Young man”= $\frac{0}{115} + \frac{0.5}{120} + \frac{1}{125} + \frac{0.5}{130} + \frac{0}{135}$ and “Tall man”= $\frac{0}{170} + \frac{0.5}{175} + \frac{1}{180} + \frac{1}{185} + \frac{1}{190}$, if possible with reason.</p> <p>d. Short note on the following terms: Hybrid Computing, Biological Neural Network, Fuzzy logic, supervise learning.</p> <p>e. Show that Hebb net does not implement the logical AND gate for binary input and output patterns.</p> <p>f. Discuss two defuzzification methods which are used in fuzzy logic.</p> <p>g. Discuss different fuzzy inference rules with their mathematical formulations.</p> <p>h. What is perceptron? Describe single layer perceptron.</p> <p>i. What do you mean by Learning and Training in a Neural Network? Briefly describe Supervised and Reinforcement learning in NN.</p> | Each question carries 4 marks |
| 3 | <p>a. Generate the output of logical OR function by McCulloch-Pitts neuron model.</p> <p>b. Verify the output of logical OR function by a single perceptron. Given initial weights $w = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$, and initial bias $b = -1$.</p> <p>c. What do you mean by Fuzzy Inference System. Describe Mamdani’s fuzzy inference method in short.</p> <p>d. Write the algorithm of perceptron neural network for several output classes.</p> <p>e. Maximize $f(x) = 4 + 10x - x^2, 1 \leq x \leq 9$ using binary coded GA. Given that population size $N = 5$, initial population $x_1 = 10111, x_2 = 10101, x_3 = 11100, x_4 = 11101, x_5 = 10100$. Random numbers for selection: 0.19, 0.63, 0.97, 0.11, 0.70. Cross-</p> | Each question carries 8 marks |

over probability, $P_c = 0.8$ and random numbers for cross-over: 0.60, 0.85, 0.57, 0.37, 0.70. Mutation probability, $P_m = 0.04$ and random numbers for mutation: 0.21, 0.37, 0.02, 0.52, 0.07, 0.97, 0.14, 0.61, 0.17, 0.09, 0.03, 0.82, 0.08, 0.21, 0.37, 0.20, 0.25, 0.72, 0.24, 0.16, 0.47, 0.58, 0.49, 0.01, 0.18. (one iteration only)

f. Using the perceptron learning rule, find the weights required to perform the following classifications $\{(1, 1, 1), 0\}, \{(-1, 1, 1), 0\}, \{(-1, -1, 1), 1\}, \{(-1, -1, -1), 1\}$.

g. Maximize $f(x) = \sqrt{x}$ in $1 \leq x \leq 16$ using binary coded GA(one iteration only) given that the population size $N = 6$, crossover probability(p_c) = 0.7 and mutation probability (p_m) = 0.3.

Initial population: 00101, 011010, 010110, 111010, 101100, 001101

Random numbers for selections: 0.15, 0.27, 0.64, 0.52, 0.79, 0.70 Random numbers for crossover: 0.62, 0.80, 0.50, 0.47, 0.75, 0.45

For Arithmetic crossover $\lambda = 0.62$. Random numbers for mutation 0.14, 0.85, 0.45, 0.94, 0.70 and permutation (Δ)=1.25.

h. Develop McCulloch-Pitts neuron model for the logical function $F(x_1, x_2, x_3) = x_1'x_2x_3 + x_1x_2'x_3 + x_1x_2x_3'$.

i. Let $X = \{a, b, c, d\}, Y = \{1, 2, 3, 4\}$ and

$$\tilde{A} = \{(a, 0), (b, 0.8), (c, 0.6), (d, 1)\}$$

$$\tilde{B} = \{(1, 0.2), (2, 1), (3, 0.8), (4, 0)\}$$

$$\tilde{C} = \{(1, 0), (2, 0.4), (3, 1), (4, 0.8)\}$$

Determine the implication relation

i) IF x is \tilde{A} THEN y is \tilde{B}

ii) IF x is \tilde{A} THEN y is \tilde{B} ELSE y is \tilde{C} .

End