JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

M.Tech-II Semester (CSE/IT)

COURSE CODE(CREDITS): 22M11CI211(3) MAX. MARKS: 35

COURSE NAME: Soft Computing

COURSE INSTRUCTOR: Dr. Simran Setia MAX. TIME: 2 Hours

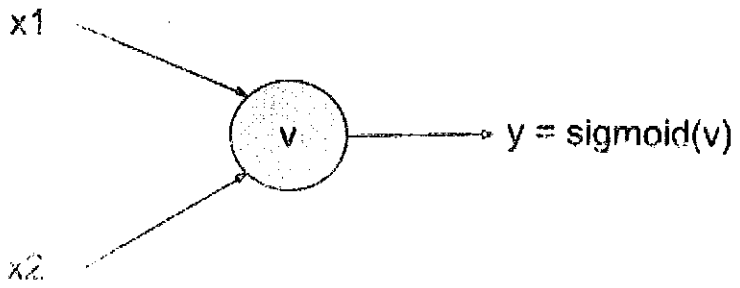
Note: ***(a)****All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving.

Q1.

A. Consider the following diagram of a single artificial neuron. The node has two integer inputs (x1,x2). Suppose the weights to the two inputs assigned are w1= 0.2, w2 = 0.5 and activation function is sigmoid function. Calculate the output y with x1 = 1, x2 = 3. [3 marks][CO3]



B. What is Hebb's rule? How is it used in perceptron training? [2 marks][CO3]

Q2. If the parents (named, P1 and P2) in a genetic algorithm are given as follows

P1: 10011100
P2: 11100111

Find the offsprings/children using the following techniques

A. Single Point Crossover
B. Double Point Crossover
C. Uniform Crossover [1+1+1][CO4]

After generating the offsprings, apply following mutation techniques on each of the offsprings generated

D. Swap Mutation
E. Inversion Mutation
F. Random resetting mutation [1+1+1][CO4]

Q3. Apply genetic algorithm to find the solution of the given problem. Find the minima of the function $x^2 - y^2$. [6 marks][CO4]

Q4.

A. What is the policy gradient algorithm?
B. Suppose an Reinforcement Learning based system is designed for cleaning dust in a room. Describe when the policy gradient should be positive for such a system.

[2.5+2.5][CO3]

Q5. Describe the difference between rank based selection methods and tournament selection method. [3 marks][CO4]

Q6. What is the fitness score of the parents if five parents are to be selected from a given population using stochastic universal sampling? [5 marks][CO5]

No of individuals	1	2	3	4	5	6	7	8	9	10
Fitness Value	2.8	2.2	1.8	1.6	1.5	1.2	1.1	1.0	0.8	0.7
Selection Probability	0.18	0.16	0.15	0.13	0.11	0.09	0.07	0.06	0.03	0.02

Q7. Let R and S be two fuzzy relations defined over A X B and B X C as follows

$$R = \begin{bmatrix} 0.6 & 0.4 & 0.1 \\ 0.7 & 0.3 & 0.4 \end{bmatrix}$$

$$S = \begin{bmatrix} 0.8 & 0.5 & 0.1 \\ 0.01 & 0.6 & 0.4 \end{bmatrix}$$

Then, Calculate the resulting relation, T, which relates elements of universe A to the elements of universe C using max-product composition. [5 marks][CO2]