

Roll No.

Total Pages : 5

009605

August/September 2022

B.Tech. (EIC) VI SEMESTER

Soft Computing (OE-603)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
2. Answer any four questions from Part-B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.

PART-A

1. (a) What is the difference between linear rank selection & tournament selection in GA? (1.5)
- (b) Why XOR function cannot be implemented using Mcculloch Pitts neuron model? (1.5)
- (c) List the stages involved in training of back propagation network. (1.5)
- (d) State α -cut decomposition theorem. (1.5)

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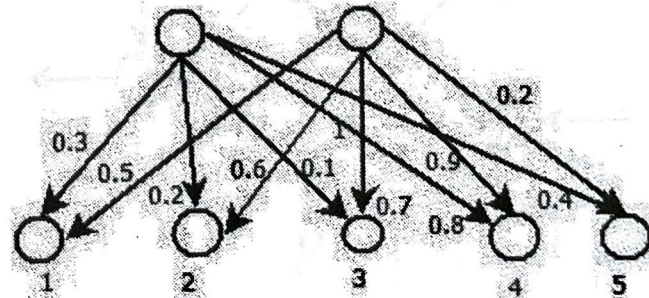
22] [P.T.O.]

- (e) Draw & label the diagram for biological neuron. (1.5)
- (f) What is meant by local minima & global minima? (1.5)
- (g) Define (i) Height (ii) Core (iii) α -cut for a fuzzy set. (1.5)
- (h) What are Linguistic Hedges? Give examples. (1.5)
- (i) Name the various composition operations used in fuzzy relations. (1.5)
- (j) Name the various operators used in GA. (1.5)

PART-B

2. (a) For the following membership functions :
 $\mu_{\text{high}} = \{(1, 0.2) (2, 0.4) (3, 0.6) (4, 0.4)\}$,
 $\mu_{\text{low}} = \{(1, 1) (2, 0.8) (3, 0.6) (4, 0.4) (5, 0.2)\}$.
 Construct the membership functions of the following compound sets :
 'Not high' and 'slightly low' (b) 'Not Very low' and 'Not Very Very high'. (7.5)
- (b) Let $X = (a, b, c, d)$, $Y = (1, 2, 3, 4)$, Fuzzy set
 $A = [(a, 0), (b, 0.8), (c, 0.6), (d, 1)]$,
 $B = [(1, 0.2), (2, 1), (3, 0.8), (4, 0)]$, Find the Implication relation (i) If "x is A THEN y is B". (7.5)

3. (a) Define Perceptron learning rule. Mention the applications of Perceptron network. List its limitations. (5)
- (b) Three fuzzy sets are defined as follows:
 $A = 0.2/LS + 0.5/MS + 0.7/HS$, $B = 0.1/PE + 0.55/ZE + 0.85/NE$, $C = 0.25/LS + 0.5/MS + 0.75/HS$
 Find the following : (a) $R = A \times B$ (b) $T = C \circ R$ using max-min. composition. (5)
- (c) Design a Hebb's net to implement logical AND fn. (use bipolar inputs & targets) (5)
4. (a) Find weight matrix to store the vectors $[1 \ 1 \ 1]$ & $[-1 \ 1 \ 1 \ -1]$ in an auto-associative memory network. (7.5)
- (b) With a neat architecture, explain the training algorithm of a hetero-associative network. (7.5)
5. (a) For the input Pattern $\{0.5, 0.9\}$, which neuron is winner using Euclidean distance. Find the weights of winning neuron using learning rate of 0.5. [5]



- (b) Compare Supervised learning, Unsupervised learning & Reinforcement learning in Neural Networks. Give examples of each. (5)
- (c) Draw & explain the architecture & learning in Discrete Hopfield Network (5)

6. (a) Consider three domains $U = V = W = \mathbb{N}$, the set of natural numbers.

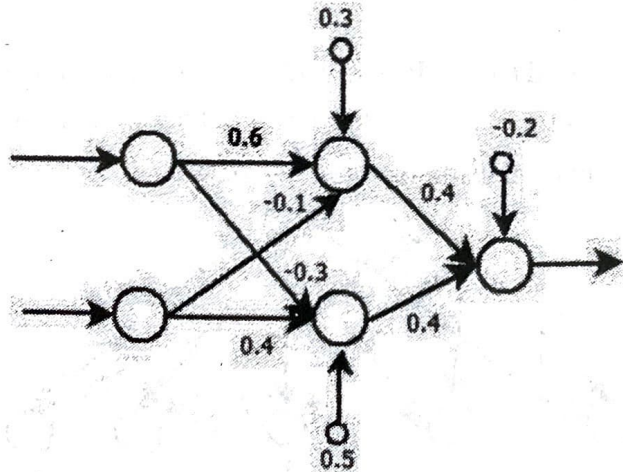
Let $f : U \times V \rightarrow W$ be given by $f(A, B) = A * B$.

Let A and B be fuzzy sets on U and V resp. given by

$A = 0.2/2 + 0.8/3 + 0.7/4$, $B = 0.7/3 + 0.6/4 + 0.5/5$

Find the fuzzy set associated with f. State the Extension Principle in fuzzy set theory. (7.5)

- (b) In BPN, for input [0, 1], output 1 & binary sigmoidal activation fn., delta at the output neuron is 0.1191. what are the values of delta at hidden neurons?



What are the factors affecting convergence in BPN Networks? (7.5)

7. (a) Write a short note on the applications of Neural Networks. (7.5)
- (b) Write a short note on 0-1 Knapsack Problem using GA. (7.5)
