Reg. No. | | | | | | | | | | |

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATIONS, NOVEMBER - 2019

SUBJECT: NEURAL NETWORK AND FUZZY LOGIC [ICE 4014]

TIME: 3 HOURS MAX. MARKS: 50

Instructions to candidates :*Answer ALL questions and missing data may be suitably assumed.*

1A. What is the necessity of activation function? Explain commonly used activation function with necessary sketches.

1B. Using the linear seperability concept, obtain the response of OR function considering bipolar inputs and targets.

1C. Using Madaline network implement XOR function with bipolar inputs and targets for the network shown in Fig. Q1C. Assume the required parameters for training of the network.

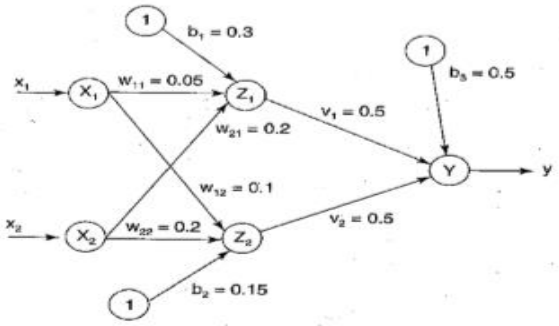

Fig. Q1C

(3+3+4)

2A Find the new weights using BPN network shown in Fig.Q2A. The network is presented with the input pattern [-1, 1] and the target output is +1. Use a learning rate of alpha=0.25 and bipolar sigmoidal activation function.

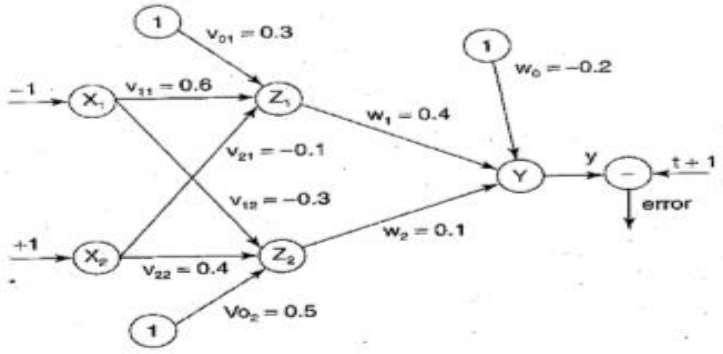

Fig. Q2A

2B Draw the architecture of Mexican hat and explain the different algorithmic steps in Mexican hat.

2C What is learning? Discuss in detail on different types of learning.

(2+3+5)

3A Define a) Euclidean distance b) Threshold c) Bias d) Momentum factor

3B Find the lambda cut relation for Lambda= 0+, 0.1, 0.4, 0.8, 0.6, 0.3 for the fuzzy relation

$$R = \begin{bmatrix} 1 & 0.1 & 0 & 0.5 & 0.3 \\ 0.02 & 0.1 & 0.55 & 1 & 0.6 \\ 0.2 & 1 & 0.6 & 1 & 0 \\ 0.03 & 0.5 & 1 & 0.3 & 0 \end{bmatrix}$$

3C For two fuzzy sets

$A = \left\{\frac{0.2}{LS} + \frac{0.5}{MS} + \frac{0.7}{HS}\right\}$ $B = \left\{\frac{0.1}{PE} + \frac{0.55}{ZE} + \frac{0.85}{NE}\right\}$

Find R=AXB. Introducing a fuzzy set C is given by $C = \left\{\frac{0.25}{LS} + \frac{0.5}{MS} + \frac{0.75}{HS}\right\}$

Find S=BxC. Find C^{o}S and C^{o}R using Max-min composition and C^{o}R using Max-product composition.

3D In the process of concrete manufacturing there are two key variables, the water content measured in percentage of total weight and the temperature at curing in the batch plant measured in degrees. We characterize each parameter in fuzzy linguistic terms as follows:

" Low temperature" $=\left\{\frac{1}{40} + \frac{0.7}{50} + \frac{0.5}{60} + \frac{0.3}{70} + \frac{0}{80}\right\}$, " High temperature"$= \left\{\frac{0}{40} + \frac{0.2}{50} + \frac{0.4}{60} + \frac{0.7}{70} + \frac{1.0}{80}\right\}$

"High water content"$= \left\{\frac{0}{1} + \frac{0.2}{2} + \frac{0.4}{3} + \frac{0.9}{4} + \frac{1.0}{5}\right\}$, "Low water content"$= \left\{\frac{1}{1} + \frac{0.8}{2} + \frac{0.6}{3} + \frac{0.4}{4} + \frac{0.2}{5}\right\}$

Find the following membership function i) temp not very low ii) temp not very high iii) temp not very low and not very high iv) water content is slightly high v) water content is fairly high vi) water content is not very low or fairly low

(3+2+2+3)

4A Explain the terms i) Fuzzy propositions ii) Decomposition of Rules.

4B What is FIS? Explain the different components of FIS with its block diagram.

4C Discuss in detail Mamdani inference method with one example.

(3+4+3)

5A Write the block diagram of Fuzzy logic control system and design a fuzzy logic controller to simulate a temperature control of a room.

5B Write short notes on i) Truth value and truth table ii) Aggregation of fuzzy rule

5C Explain different Maxima method of defuzzification techniques.

(4+3+3)

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