Exam Date & Time: 19-May-2022 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SIXTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY 2022

ARTIFICIAL NEURAL NETWORKS [BME 4059]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

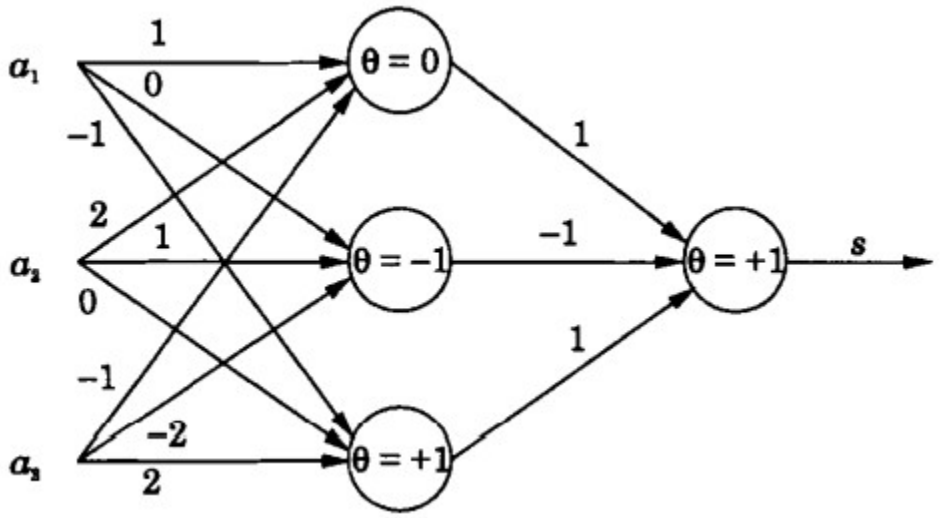
Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) What is meant by topology of artificial neural networks? Examine the basic topological structures of artificial neural networks. (5)

A)

B) Explain the significance of the initial values of weights and the learning rate parameter in the Perceptron Learning Law. (3)

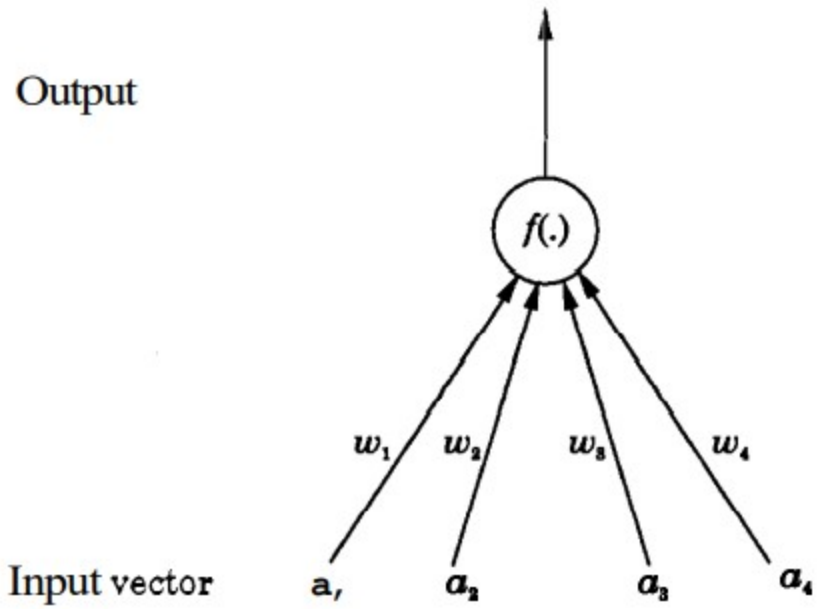
C) Evaluate the output of the network as shown in the below figure for the input $[1\ 1\ 1]^T$.



(2)

2) Determine the weights of the network in Figure shown below after one iteration using Hebb's law for the following set of input vectors. Consider the initial weights as $[1\ 0\ 0\ 0]^T$ and learning rate parameter as 1. Input: $[1\ 1\ 0\ 0]^T$, $[1\ 0\ 0\ 1]^T$, $[0\ 0\ 1\ 1]^T$ and $[0\ 1\ 1\ 0]^T$. Choose the output function as $f(x) = \frac{1}{1+e^{-x}}$.

A) (5)



B) Develop the Shunting Activation Dynamics Models for On-centre off-surround configuration to make it sensitive to changes in the external input. (3)

C) Explain the noise-saturation dilemma in activation dynamics. (2)

3) Distinguish between Activation and Synaptic Dynamics Models. (5)

A)

B) Identify the requirements of learning laws for effective implementation. (3)

C) Distinguish between an equilibrium state and a stable state. (2)

4) Distinguish between pattern association, pattern classification and pattern mapping tasks. (5)

A)

B) Distinguish between linearly separable and linearly inseparable problems. (3)

C) Examine the difference between the accretive and interpolative type of clustering problems. (2)

5) Design the Perceptron learning law for the perceptron classification problem. Consider the case of linearly separable classes. (5)

A)

B) Explain the nature of the input vectors (A) when $W = BA^T$ for the optimal choice of weight matrix (W). (3)

C) Compute the weight matrix for the following pattern association task (2)

$$a_1 = \left[\frac{1}{6} \quad -\frac{5}{6} \quad -\frac{1}{6} \quad \frac{1}{2}\right]^T \; b_1 = [1 \quad 0 \quad 0]^T$$

$$a_2 = \left[\frac{1}{2} \quad \frac{1}{2} \quad -\frac{1}{2} \quad \frac{1}{2}\right]^T \; b_2 = [0 \quad 1 \quad 0]^T$$

$$a_3 = \left[-\frac{5}{6} \quad \frac{1}{6} \quad -\frac{1}{6} \quad \frac{1}{2}\right]^T \; b_3 = [1 \quad 0 \quad 0]^T$$

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