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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING**

**MAKE UP EXAMINATION – JAN 2023**

**Course Code:** ECE 295

**Course Name:** Artificial Neural network

**Programme :** B.Tech - ECE

**Date:** 24/01/2022

**Time:** 9:30AM - 12:30PM

**Max Marks:** 100

**Weightage:** 50%

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**Instructions:**

- (i) Read Questions carefully and answer accordingly*
  - (ii) All Questions are compulsory*
  - (iii) Any missing data can be suitably assumed*
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**Part A [Memory Recall Questions]**

**Answer 20 Questions. Each question carries TWO marks.**

**20x2=40m**

1. BPA is one method of training MLP's. It uses the transmission of error back through the network to allow weights to be adjusted so that the network can learn. What is true regarding back propagation rule? **(CO-1)[Knowledge]**

- a) It is a multilayer feed forward Network
- b) final output does not depend on some of the hidden neurons
- c) hidden layers output is not all important, they are only meant for supporting input and output layers
- d) none of the mentioned

2. A linear separable function can be implemented using SLP. It takes both real and Boolean inputs and associates a set of **weights** to them, along with a **bias**. What is the objective of perceptron learning? **(CO-1)[Knowledge]**

- a. adjust weight along with class identification
- b. weight adjustment
- c. error correction
- d. none of the above mentioned

3. Change in weight is done every time an error is got at the output neuron .The expression for weight correction for a synaptic weight connecting neuron i to neuron j which is defined by the delta rule is given by **(CO-1)[Knowledge]**

- a. Weight correction = (learning rate parameter) \* (local gradient)\* (input signal of neuron j )
- b. Weight correction = (learning rate parameter) \* (input weight)\* (input signal of neuron j)
- c. Weight correction = (error energy) \* (local gradient)\* (input signal of neuron j)
- d. Weight correction = (output signal of a neuron) \* (local gradient)\* (input signal of neuron j )

4. Training an Artificial neural network for complex problems uses MLP in which BPA is an algorithm were there can be 2 types of training which are online learning and batch learning. Which of the below statement is true with respect to online learning. **(CO-1)[Knowledge]**

- a. learning is done with more examples.
- b. adjustments to the synaptic weights of the MLP are performed after the presentation of all the N examples in the training sample t that constitute one epoch of training
- c. the synaptic weights of the MLP are performed on an example-by-example basis.
- d. none of the above

5. **Flip-flops** and latches are fundamental building blocks of digital electronics systems. In SR flip-flop S and R stands for **(CO-1)[Knowledge]**

- a. S= stable, R= Reset
- b. S= set, R= reset
- c. S= store, R= Restore
- d. None of the above.

6. A **Perceptron** is a neural net used for supervised learning of binary classifiers. Rosenblatt's perceptron is built around a nonlinear neuron, namely **(CO-1)[Knowledge]**

- a. hyperbolic tangent model of a neuron
- b. The threshold model of a neuron
- c. the McCulloch–Pitts model of a neuron
- d. none of the above.

7. Least mean squares (**LMS**) algorithms are a class of **adaptive filter** used to mimic a desired **filter** by finding the **filter** coefficients. Here LMS stands for **(CO-1)[Knowledge]**

- a. Least median square
- b. local mean square
- c. Least mean square
- d. Least maximum square

8. Activation functions are mathematical equations that determine the **output** of a neural network. Activation function is also called as **(CO-1)[Knowledge]**

- a. Stable function
- b. Squashing Function
- c. Random Function
- d. None of the above

9. An artificial **neural network's learning** rule or **learning** process is a method, mathematical logic or algorithm which improves the **network's** performance and/or training time. Hebbian learning is where there is **(CO-1)[Knowledge]**

- a. Self - learning without a teacher
- b. learning with the help of a teacher
- c. Learning from the error at the output
- d. None of the above

10. There are two phases of operation in back propagation algorithm. The phase in which error signal is propagated to correct the weights is called **(CO-1)[Knowledge]**
- a) Forward phase
  - b) Backward phase
  - c) feed forward phase
  - d) none of the above
11. Full adders are used to add 3 bit binary numbers. Write the truth table of a full adder and the sum and carry equation? **(CO-1)[Knowledge]**
12. Latches are memory elements in a digital circuit. Draw the perceptron model of a latch and write the required weights and bias. **(CO-1)[Knowledge]**
13. It is sometime desirable to select one input out of the many incoming input signal using multiplexer. Draw the truth table of 4:1 Mux. Also explain the role of select lines. **(CO-1)[Knowledge]**
14. Perceptron convergence theorem is used to find the range of values of weights. Mention the beta equation and state its significance? **(CO-1)[Knowledge]**
15. There are two types of signal in back propagation algorithm. Mention the two types of signals and their importance in brief. **(CO-1)[Knowledge]**
16. In online Learning adjustments to the synaptic weights of the MLP are performed on example by example basis. So online learning tries to minimize which error? **(CO-1)[Knowledge]**
17. Back Propagation Algorithm has different stopping criteria to terminate the training steps. Mention any two criteria in brief. **(CO-1)[Knowledge]**
18. BPA can be made better using different heuristics. Discuss any two such techniques. **(CO-1)[Knowledge]**
19. Hebbian learning is learning through self-experience. Mention the equation for finding the weight update and new weights in Hebbian learning. **(CO-1)[Knowledge]**
20. Artificial neural network is inspired by human brain. Mention any two analogy between them. **(CO-1)[Knowledge]**

### Part B [Thought Provoking Questions]

Answer 3 Questions. Each question carries TEN marks.

10x3=30m

21. Adders and subtractors are building blocks of many circuits are used in many microcontrollers and microprocessors. Explain the truth table of half subtractor and its implementation using perceptron model. Comment on the number of hidden layer required. Verify the structure using truth table by taking all four combinations (00, 01, 10, 11).

**(CO-2)[Comprehension]**

22. Neural networks are used to solve day to day life problems of the society. Mention any two problems of city/village and propose the solution using neural network. Explain the learning paradigm, network architecture and activation function used in all two scenarios.

**(CO-2)[Comprehension]**

23. The weights of neural network determine the performance a neural network. Convergence theorem is used to find the range of weight update  $W_{n+1}$ . Derive the expression to find the lower and upper value of  $W_{n+1}$  i.e. alpha and beta equation.

**(CO-2)[Comprehension]**

### Part C [Problem Solving Questions]

Answer 3 Questions. Each question carries TEN marks.

3X10=30m

24. MUX is used to select any one incoming input to the output using select lines. Write the truth table of MUX and state the combination circuit to implement the same. Also draw the perceptron implementation of 4:1 MUX given the bias as -3 for all the perceptron.

**(C.O.3) [Application]**

25. Apply SLPA to 3 input OR GATE – Assume all initial weights are zero, Bias = -2, LR = 1. Draw the truth table for 3 input OR gate and find the input synaptic weights for the given bias weight using error correction learning algorithm.

**(C.O.3) [Application]**

26. Full adders are used to add three bit binary numbers. The sum equation of full adders requires XOR gates and carry equation requires AND gates. Draw the XOR implementation of full adder using combinational circuits. Connect two perceptron model of XOR gate to create a full adder.

**(C.O.3) [Application]**