



**Course Name – Introduction To Machine Learning**

**Assignment – Week 6 (Neural Networks)**

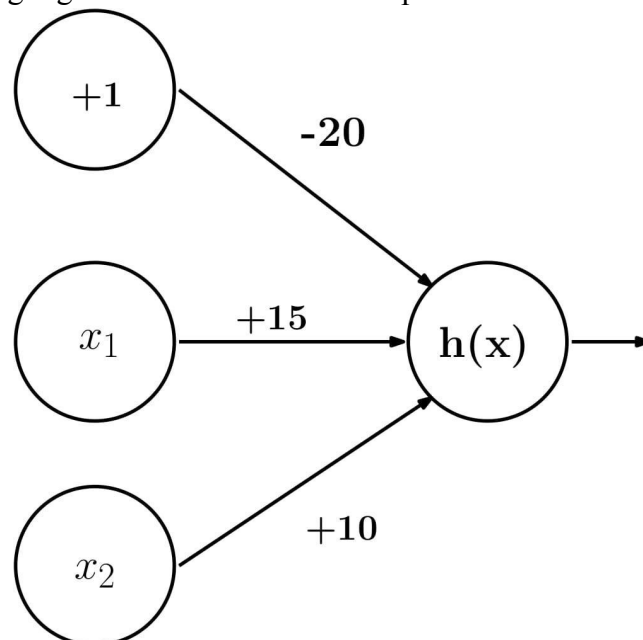
**TYPE OF QUESTION: MCQ/MSQ**

**Number of Question: 10**

**Total Marks: 10x2 = 20**

**Question 1:**

The neural network given below takes two binary valued inputs  $x_1, x_2 \in \{0,1\}$  and the activation function is the binary threshold function ( $h(x) = 1$  if  $x > 0$ ; 0 otherwise). Which of the following logical functions does it compute?



- A) AND
- B) OR
- C) NAND
- D) None of the above

**Correct Answer. A**

**Detailed Solution:**  $h(x) = 1$  if  $(15x_1 + 10x_2 - 20) > 0$ ; 0 otherwise

if we write the truth table for  $h(x)$ , it will be:

$x_1$	$x_2$	$h(x)$
0	0	0
0	1	0
1	0	0
1	1	1



The truth table for  $h(x)$  is the same as the truth table for the AND logical function.

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**Question 2:**

What is the sequence of the following tasks in a perceptron?

- I) Initialize the weights of the perceptron randomly.
  - II) Go to the next batch of data set.
  - III) If the prediction does not match the output, change the weights.
  - IV) For a sample input, compute an output.
- A) I, II, III, IV  
B) IV, III, II, I  
C) III, I, II, IV  
D) I, IV, III, II

**Correct Answer: D**

**Detailed Solution:** Refer to the lecture. D is the correct sequence.

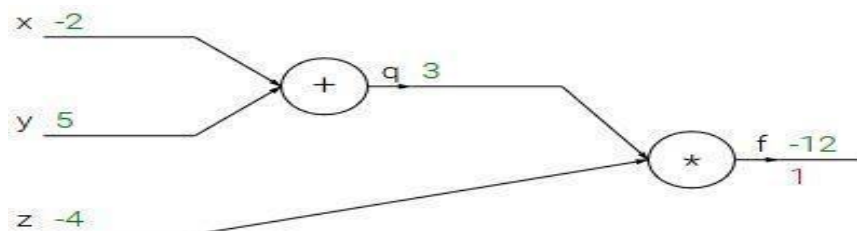
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**Question 3:**

Suppose you have inputs as  $x$ ,  $y$ , and  $z$  with values  $-2$ ,  $5$ , and  $-4$  respectively. You have a neuron 'q' and neuron 'f' with functions:

$$q = x + y$$
$$f = q * z$$

Graphical representation of the functions is as follows:



What is the gradient of  $f$  with respect to  $x$ ,  $y$ , and  $z$ ?

- A)  $(-3, 4, 4)$   
B)  $(4, 4, 3)$   
C)  $(-4, -4, 3)$   
D)  $(3, -4, -4)$



**Correct Answer: C**

**Detailed Solution:** To calculate gradient, we should find out  $(df/dx)$ ,  $(df/dy)$  and  $(df/dz)$ .

$$\frac{df}{dx} = \frac{d}{dx} ((x + y)z) = z \cdot 1 = z = -4$$

$$\frac{df}{dy} = \frac{d}{dy} ((x + y)z) = z \cdot 1 = z = -4$$

$$\frac{df}{dz} = \frac{d}{dz} ((x + y)z) = (x + y) = (-2 + 5) = 3$$

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**Question 4:**

For a fully-connected neural network with one hidden layer, what effect should increasing the number of hidden units have on bias and variance?

- A. Decrease bias, increase variance
- B. Increase bias, increase variance
- C. Increase bias, decrease variance
- D. No effect

**Correct Answer: A**

**Detailed Solution:** Adding more hidden units should decrease bias and increase variance. In general, more complicated models will result in lower bias but higher variance, and adding more hidden units certainly makes the model more complex.

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**Question 5:**

Which of the following is true about model capacity (where model capacity means the ability of a neural network to approximate complex functions)?

- A) As number of hidden layers increase, model capacity increases
- B) As dropout ratio increases, model capacity increases
- C) As learning rate increases, model capacity increases
- D) None of these.

**Correct Answer: A**

**Detailed Solution:** As the number of hidden layers increase, the ability of the neural network to model complex functions increases.



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**Question 6:**

The back-propagation learning algorithm applied to a two layer neural network

- A) always finds the globally optimal solution.
- B) finds a locally optimal solution which may be globally optimal.
- C) never finds the globally optimal solution.
- D) finds a locally optimal solution which is never globally optimal

**Correct Answer: B**

**Detailed Solution:** The back-propagation algorithm finds a local optimal solution, which may be a global optimal solution.

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**Question 7:**

Which of the following gives non-linearity to a neural network

- A) Gradient descent
- B) Bias
- C) Sigmoid Activation Function
- D) None

**Correct Answer: C**

**Detailed Solution:** An activation function such as sigmoid gives non-linearity to the neural network.

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**Question 8:**

The network that involves backward links from outputs to the inputs and hidden layers is called as

- A) Self-organizing Maps
- B) Perceptron
- C) Recurrent Neural Networks
- D) Multi-Layered Perceptron

**Correct Answer: C**

**Detailed Solution:** Recurrent Neural Networks involve backward links from outputs to the inputs and hidden layers.



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**Question 9:**

A Convolutional Neural Network(CNN) is a Deep Neural Network which can extract various abstract features from an input required for a given task. Given are the operations performed by a CNN on an input:

- 1) Max Pooling
- 2) Convolution Operation
- 3) Flatten
- 4) Forward propagation by Fully Connected Network

Identify the correct sequence of operations performed from the options below:

- A) 4,3,2,1
- B) 2,1,3,4
- C) 3,1,2,4
- D) 4,2,1,3

**Correct Answer: B**

**Detailed Solution:** Follow the lecture slides.

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**Question 10:**

In training a neural network, we notice that the loss does not increase in the first few starting epochs: What is the reason for this?

- A) The learning Rate is low.
- B) The Regularization Parameter is High.
- C) Stuck at the Local Minima.
- D) All of the above could be the reason.

**Correct Answer: D**

**Detailed Solution:** The problem can occur due to any one of the reasons above.

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**END**