



TECHNICAL UNIVERSITY OF MOMBASA

INSTITUTE OF COMPUTING AND INFORMATICS

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

UNIVERSITY EXAMINATION FOR:

BTIT2012S & BSSC2013S

EIT4351; EIT4417: NEURAL NETWORKS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 10 May 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

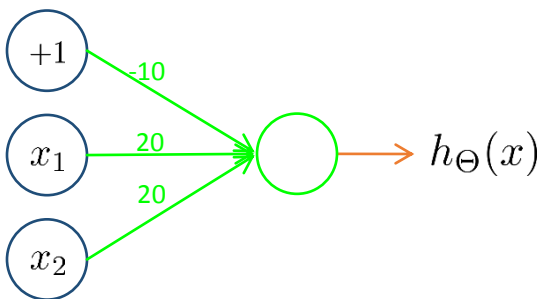
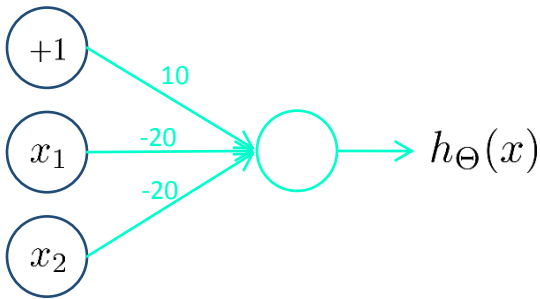
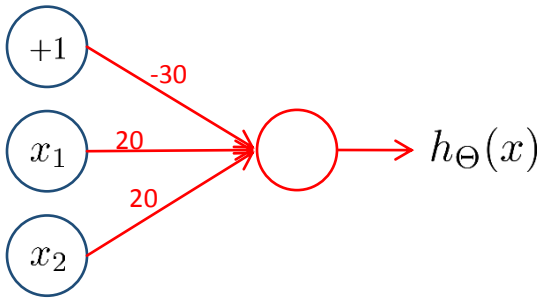
Question ONE (Compulsory)

- a) Machine learning algorithms may be grouped according to learning style and according to similarity in function, describe this grouping with examples and a focus of where neural network lies (6 marks)
- b) Explain briefly with the aid of a neuron drawing how the human brain works (6 marks)
- c) With a drawing of a simple artificial neuron, explain the learning process (6 marks)
- d) Explain pattern recognition as an application of neural networks. (4 marks)
- e) Distinguish between feed forward and feedback neural networks (4 marks)
- f) State the design considerations for a neural network (4 marks)

Question TWO

- a) Using the AND, OR and NOT gates respectively, illustrate the operation of the neural network by determining the output of each of the hypotheses of the given networks.

$$x_1, x_2 \in \{0, 1\}$$



(10 marks)

c) Generate an XNOR gate of the above three networks as a way of building a neural network having one hidden layer, and determine the final output of the hypothesis. (10 marks)

Question THREE

a i) Draw a neural network with the following features: input layer (3 units); two hidden layers (5 units each); an output layer (4 units) (x, y). (4 marks)

ii) Using the neural network, state the equation for the activation (forward propagation) of each of the layers for one training set example. (8 marks)

iii) State the corresponding equations for the back propagation algorithm. (6 marks)

iv) What are the benefits of carrying out back propagation during the training of the neural network
(2 marks)

Question FOUR

a) Discuss the general procedure of training a neural network. (10 marks)

b) Explain the terms bias and variance as used in machine learning and state how high variance could be overcome (6 marks)

c) Discuss the challenges of a small neural network compare to the large neural network in relation to bias and variance. (4 marks)

Question FIVE

a) Explain the term activation function in neural networks (2 marks)

b) Explain three activation functions with the aid of diagrams and equations (6 marks)

c) Differentiate with simple network drawings between: feed forward neural network, and recurrent network (6 marks)

d) Compare the three neural network architectures: perceptron; multilayer perceptron; and radial basis function (6 marks)