MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE & TECHNOLOGY

MAIN CAMPUS

SCS 425: NEURAL NETWORKS

Date: 8th December, 2016   Time: 12.00 - 3.00pm

INSTRUCTIONS:
- Answer ALL Questions in Section A and any other TWO in Section B
- Write your registration number on all sheets of the answer book used
- Use a new page for every Question attempted, and indicate the question number on the space provided on each page of the answer sheet
- Fasten together all loose answer sheets used
- Switch off all mobile phones and PDAs.

Question One

a)

    i.   Mention three types of supervised learning.   **(3 marks)**

    ii.   What can supervised learning be used for?   **(3 marks)**

b) Use diagrams to explain how human neurons transmit signal **(7 marks)**

c) Explain, with the aid of mathematical equations, the operation of the following neurons

    i)   Linear neurons   **(3 marks)**

    ii)   Binary threshold neurons   **(3 marks)**

    iii)   Sigmoid neurons   **(3 marks)**

d) Explain the difference between linear regression and logistic regression

    (4 marks)

e) Explain how logistic regression can be used for classification purposes

    (4 marks)

Question Two

a) Sketch the schematics and derive the outputs of neural networks to implement:

  i)   AND gate   **(7 marks)**

  ii)   NOT gate   **(7 marks)**

b) Show how to combine the above to implement a NAND gate.   **(6 marks)**
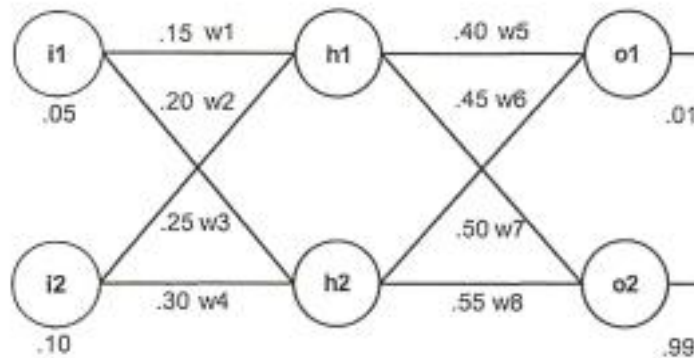
Question Three

a) Derive the equation for the linear regression cost function **(10 marks)**

b) Explain how gradient descent can be used to find the optimum values of Θ in the hypothesis. **(10 marks)**

$$h_\Theta(x) = \Theta_0 + \Theta_1(x)$$

Question Four

Consider the neural network below, with the given inputs 0.05 and 0.10 giving expected outputs 0.01 and 0.99.

a) Compute the actual outputs o1 and o2. Assume the activation units use a sigmoid function.

Question 5

a) Briefly describe the back propagation algorithm **(4 marks)**

Use the diagram in question 4 to answer 5 b.

b) Using back propagation algorithm, calculate the output error due to the weight w_5.

(16 marks)

The End