

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
COMPUTER SCIENCE DEPARTMENT
MAY EXAMINATIONS 2002**

**SUBJECT: Neural Networks
CODE: SCS 5202**

INSTRUCTION TO CANDIDATES

The Question paper consists of seven (7) questions
Answer 5 Questions only

Time: 3 hours

QUESTION 1

(a) Neural computing is becoming a major processing technique. Describe the advantages and disadvantages such a technique has over conventional processing techniques. [8]

(b) You are employed as a consultant within a computer company. Your manager requests your opinion as to the feasibility of using neural networks to perform the following tasks for the following customers.

Customer A: - wishes to carry out robot navigation and multi-sensor integration [4]

Customer B: - wishes to recognize printed letters on envelopes. [4]

Customer C: - wishes to recognize cloud formation so that a subsequent weather prediction can be carried out. This customer has data on 100 cloud formations available for training the neural network. [4]

In each case give your opinion as to the suitability of using a neural network to solve the problems.

State any further information you would require from the customer and any assumptions made.

QUESTION 2

What is the difference between supervised and unsupervised learning in neural networks? Give example architectures for both of these types of learning and discuss their strengths and weaknesses. [20]

QUESTION 3

- (a) What do you understand by Adaptive Resonance Theory? [8]
- (b) Describe how ART networks can be used to do pattern recognition. [12]

QUESTION 4

Neural networks are often used commercially for prediction tasks. *Guti* is a low flying cloud weather phenomenon prevalent in Zimbabwe, caused by a combination of different weather parameters like temperature, wind speed, wind direction, pressure changes and pressure trends. Using a simulation language like C++ model a feedforward network that attempts to predict this phenomenon. It is sufficient to design the relevant classes and their relationships, without implementing the functions.

QUESTION 5

- (a) What are the advantages and disadvantages of the Backpropagation training algorithm? [8]
- (b) What is the difference between Backpropagation and Recurrent networks? [4]
- (c) Give an example of a Recurrent network application. [8]

QUESTION 6

Define the following terms:

- (i) Learning rate [4]
- (ii) Activation [4]
- (iii) Convergence [4]

- (iv) Gradient Descent [4]
- (v) Momentum term [4]

QUESTION 7

- (a) What does a typical PDP model consist of? [4]
- (b) Describe all the processes involved in developing a PDP model. [16]

END OF QUESTION PAPER

GOOD LUCK!