Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.Tech (CSE)/SEM-2/MCS-204D/2013
2013
AI & NEURAL NETWORK

Time Allotted : 3 Hours　　　　　　　　　　*Full Marks :* 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words as far as practicable.*

Answer Question No. **1** and any *three* from the rest.

1.　a)　Prove that the statement $((\sim P \vee Q) \equiv (P \rightarrow Q)$ is valid.

　　b)　How multiplayer perceptron solves an XOR problem ?

　　c)　Consider the following definition :

　　　　"Persons of age 15 to 40, 30 to 60, 50 to 75 are known as young, middle-aged, old respectively." Now construct the membership graph and membership functions for linguistic variables young, middle-aged and old.

　　d)　"Clustering is an unsupervised leaning and classification is supervised leaning" — justify it.　　4×4

2.　a)　Consider the following problem :

　　　　You are given two jugs, a 4 gallon and a 3 gallon. Neither have any measuring markers on it. There is pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4 gallon jug ? Solve the problem using the construction of production rules.

30153 (M.Tech)　　　　　　　　　　　　　　　　[Turn over
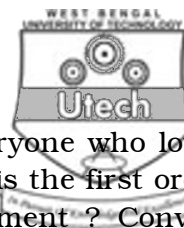
b) Consider the following statement : "Everyone who loves all animals is loved by someone." What is the first order logic representation of the above statement ? Convert the first order representation in CNF.

c) What are the representations of Modus ponens and modus tollens ? 8 + 6 + 4

3. a) Discuss the organization of an expert system. State the differences between expert system and conventional methods. What are different types of errors in the development stage of expert systems.

b) Discuss AO^* algorithm with a suitable example. Make a comparison between depth first research and breadth first search. (4 + 3 + 3) + (5 + 3)

4. a) State the back-propagation algorithm for multiplayer feed-forward neural network with proper mathematical notation.

b) State different types of leaning mechanism with proper example.

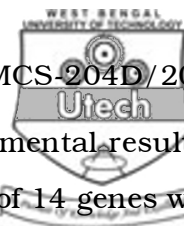c) Consider a gene HBB whose normal and diseased replications are given below :

Normal state	Diseased state
4	12
6	13
9	12
7	15

Compute the t-value of gene HBB and measure its level of significance :

t-table :

Degree of freedom	$P = 0·1$	$P = 0·05$	$P = 0·01$	$P = 0·001$
6	1·94	2·45	3·71	5·96

7 + 6 + 5

5. Let's look at an example based on the experimental result of Roth-cancer research lab. The table consists of 14 genes with 3 attributes (viz., GO attributes, Expression level and Pesudo gene found) and one class label : cancer mediating. Finding out the test attribute and draw the decision tree. Generate the rules from decision tree.

Gene-ID	GO attributes	Expression level	Pseudo gene found	Class label : Cancer mediating
$g1$	$\Leftarrow 30$	High	No	No
$g2$	$\Leftarrow 30$	High	No	No
$g3$	31 ... 40	High	No	Yes
$g4$	> 40	Medium	No	Yes
$g5$	> 40	Low	Yes	Yes
$g6$	> 40	Low	Yes	No
$g7$	31 ... 40	Low	Yes	Yes
$g8$	$\Leftarrow 30$	Medium	No	No
$g9$	$\Leftarrow 30$	Low	Yes	Yes
$g10$	> 40	Medium	Yes	Yes
$g11$	$\Leftarrow 30$	Medium	Yes	Yes
$g12$	31 ... 40	Medium	No	Yes
$g13$	31 ... 40	High	Yes	Yes
$g14$	> 40	Medium	No	No

10 + 4 + 4

6.   Write short notes on the following :

4 + 5 + 4 + 5

   a)   K-SOM

   b)   ADALINE-Neural Network Model

   c)   Linear regression in prediction

   d)   RBF Neural Network Model.

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