



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.TECH(CSE)/SEM-2/MTCSE-242/2012**

**2012**

**AI & SOFT COMPUTING**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

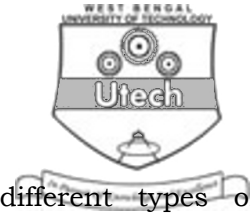
*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP - A**

Answer any *five* questions of the following.

5 × 5 = 25

1. a) Define 'Soft Computing'. How does it differ from traditional 'hard computing' ?  
b) Critically comments, 'Linear independence implies linear separability, but reverse is not true'. 3 + 2
2. a) What do you mean by supervised, reinforcement and unsupervised learning rules ?  
b) State the Delta learning rule. 4 + 1
3. What do you mean by Fuzzy Logic ? How is it different from classical logic ?  
Explain with suitable example. 5
4. Compare and contrast hill climbing and best-first search procedures. 5



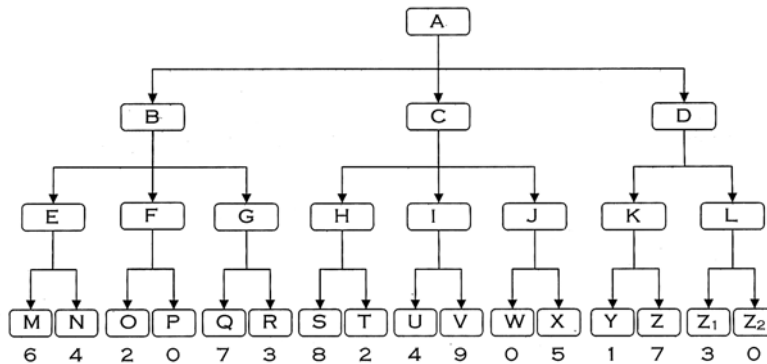
5. a) What is perception ?  
 b) Define intelligent agent. Explain different types of environment related to intelligent agent.  
 c) How procedural knowledge differs from declarative knowledge ? 1 + 2 + 2
6. Write a program in prolog or lisp to find the gcd of two numbers. 5
7. What is expert system ? Why is it required ? 2 + 3

### GROUP – B

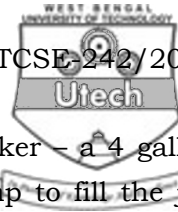
(Answer any *three* questions from the following)

$3 \times 15 = 45$

8. Given a game tree for a two-ply game, where the evaluation functions for winding are given at the leaf nodes. Assume that the game is opened by the maximize.



- a) Using Minimax algorithm, determine which nodes the maximizer and the minimizer should select in their first turn.
- b) Identify the nodes that will be pruned by invoking Alpha-Beta algorithms. 8 + 7



9. a) Given two jugs with no measuring marker – a 4 gallon jug and a 3 gallon jug. There is a pump to fill the jug with water. How do you get exactly 2 gallons of water in the 4 gallon jug ? Give the state space for the problem, describe the production rules and give a possible solution.

- b) Give the following initial and the goal state for the Block's world problem. Construct a set of operators (rules) and hence generate a plan to reach the goal state from the initial state.

Initial State : On (C, A)

Clear (C),

On (B, Table),

Clear (B),

Goal State : On (B, A)

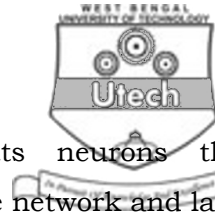
On (C, B). (6 + 3) + 6

10. a) Briefly discuss about linearly separable problem and the solution for XOR problem.

Also suggest a network that can solve XOR problem.

- b) Explain the Back Propagation algorithm and derive the expressions for weight up-date relations for multi-layer feed forward networks using differential activation function.
- c) On what basis is the number of hidden layers and the number of neurons in each hidden layer selected.

(2 + 4) + 7 + 2



11. a) Design network of McCulloch-Pitts neurons that implement logical NOT gate. Draw the network and label all the weight and threshold values.

b) Discuss the learning process of Hebb's net. Consider the Hebbian learning rule for an ANN with a single PE which is LTU. There are four inputs and corresponding weights to this PE. Consider four input vectors :

$$X^{(1)} = (1, 1.5, 0.5, 0)^T, X^{(2)} = (-0.5, 1, 0, 1.5)^T,$$

$$X^{(3)} = (-1, 0, -1, -0.5)^T, X^{(4)} = (-1, -0.5, 0, 1)^T$$

The initial weight vector is selected as,

$$W^{(1)} = (1, 0, -1, 0)^T \text{ and } \eta = 1.$$

c) Critically comment, "Delta learning rule is better than Perceptron learning rule" 5 + (2 + 5) + 3

12. a) Explain the cycle of Genetic algorithm.

b) Explain Cross-over and Mutation operations of Genetic algorithm.

c) Discuss Roulette Wheel Selection to create new offspring to select the best chromosomes.

d) Let's suppose two fuzzy sets  $A$  &  $B$  are defined as follows :

$$A = \{(3, 0.5), (5, 1), (7, 0.6)\}, B = \{(3, 1), (5, 0.6)\}$$

$$\text{Now find } A \times B, A + B, A.B, A \oplus B. \quad 2 + 5 + 4 + 4$$