Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.TECH (MSS)/SEM-2/MMS-204/2012

2012
INTELLIGENT 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.

Answer any *five* of the following questions.

5 × 14 = 70

1. a) Explain with the help of an example, the limitation of Propositional Logic. How does First Order Predicate Logic (FOPL) overcome this limitation ? 7

   b) What are the constituent elements of FOPL well-formed formulae (wff) ? Explain the use of Skolem Function with an appropriate example. 7

2. a) Express the following statements of FOPL wffs.

   i) All persons love a lover

   ii) For all positive integers there is a greater positive integer

   iii) Anything anyone eats and is not killed-by is food.

   6

b) What do you mean by a Resolution Refutation system ? Using the technique of resolution refutation, prove the conclusion given the following premises :

Premises :

i) Whoever can read is literate.

ii) Dolphins are not literate.

iii) Some Dolphins are intelligent.

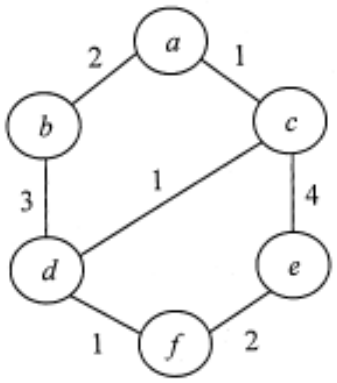
Conclusion :

iv) Some who are intelligent cannot read. 8

3. Explain the terms "state space" and "state space search" with appropriate examples. Present a generalized State Space Search algorithm, and in terms of this algorithm differentiate between exhaustive search and heuristic search.

4. a) What is an AND-OR graph ? Explain its use in solving a decomposable problem. 6

b) The figure below shows a network of cities *a*, *b*, *c*, *d*, *e* and *f* along with the cost associated with each interconnection path. We are to find a minimal length path from city *a* to city *f*. Solve the problem using AO* algorithm. 8



5. What do you mean by the Hill Climbing search strategy ? Propose a suitable objective function to solve the CNF-satisfiability problem through hill climbing. Solve the following instance of the said problem through hill climbing search using the proposed objective function.

$F(x1, x2, x3, x4) = (x1' + x2) \,.\, (x3 + x4') \,,\, (x1' + x4') \,.\, (x2 + x3)$

6. Consider the following membership function for a fuzzy set F.

$$\mu_F(x) = \begin{cases} 0, & if \ -2 \le x \le -1 \\ x+1, & if \ -1 \le x \le 0 \\ 1-x, & if \ 0 \le x \le 1 \\ 0, & if \ 1 \le x \le 2 \end{cases}$$

Show the corresponding membership profile.

Define the following transformations on a fuzzy set : dilation, concentration, contrast intensification, fuzzification.

Apply these transformations on the membership profile mentioned above and show the approximate shapes of the resultant function graphically. 4 + 4 + 6

7. Show the structure of a biological neuron and present and describe an artificial neuron inspired by such biological neuron. What do you mean by learning by a perceptron and what is basic perceptron learning rule ?

8. Describe the basic structure of a Genetic Algorithm and explain its salient features.