(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2149   Roll No. ☐☐☐☐☐☐☐☐☐☐

MCA
(SEMESTER-V) THEORY EXAMINATION, 2012-13
ARTIFICIAL INTELLIGENCE

Time : 3 Hours]   *[Total Marks : 100*

Section – A

1.   Attempt **all** parts.   10 × 2 = 20

   (a)   What are the task domains of artificial intelligence ?

   (b)   What are the factors that a rational agent should depend on at any given time ?

   (c)   Differentiate blind search and heuristic search.

   (d)   Give the PEAS description of an "Interactive English Tutor" system.

   (e)   List the various informed search strategy.

   (f)   Define Skolear constant.

   (g)   When learning problem is said to be realizable or unrealizable ?

   (h)   List the advantages of Decision Trees.

   (i)   What are the components of pattern recognition system ?

   (j)   What are the various approaches for pattern recognition ?

Section – B

2.   Attempt any **three** parts.   10 × 3 = 30

   (a)   (i)   For each of the following agent, develop a PEAS description of the task environment.

               (a)   Robot Soccer Player

               (b)   Internet book-shopping agent

         (ii)   Both the performance measure and the utility function measure how well an agent is doing ? Explain the difference between two.

(b) Explain the following uninformed search strategies with examples :

   (i) Breadth First Search

   (ii) Uniform Cost Search

(c) What do you mean by supervised and unsupervised learning ? Explain.

(d) (i) Describe how Branch and Bound Technique could be used to find the shortest solution to a traveling salesman.

   (ii) Explain the effect of overestimation and underestimation of it on A* algorithm.

(e) Convert the following English sentences into predicate logic :

   (i) Every fisherman likes the river.

   (ii) No red flower is poisonous.

   (iii) You can fool some of the people all of the time.

   (iv) There are exactly two purple mushrooms.

   (v) X is above Y if X is on directly on top of Y or else there is a pile of one or more other objects directly on top of one another starting with X and ending with Y.

Section – C

Attempt any **five** questions : $10 \times 5 = 50$

3. Consider the following sentences :

   (a) John like all kinds of food.

   (b) Apples are food.

   (c) Chicken is food.

   (d) Anything anyone eats, and is not killed by is food.

   (e) Jack eats peanut and is still alive.

   (f) Jill eats everything Jack eats.

Represent these sentences into predicate logic and prove that "John likes peanuts" through resolution.

4. What is reinforcement learning ? Explain

   (a) Passive reinforcement learning

   (b) Active reinforcement learning.

5. Consider a statespace where the start state is number 1 and the successor function for state n return two states, numbers 2n and 2n + 1

   (a) Draw the portion of the state space for states 1 to 15.

   (b) Suppose the goal state is 11. List the order in which nodes will be visited for breadth first search, depth-limited search with limit 3, and iterative deeping search.

   (c) What is the branching factor in each direction of the bidirectional search ?

6. Consider the basic concepts of game playing, using tic-tac-toe as an example. We define X_n as the number of rows, columns, or diagonals with exactly n X's and no O's. Similarly, O_n is the number of rows, columns, or diagonals with just n O's. The utility function assigns + 1 to any position with $X_3 = 1$ and – 1 to any position with $O_3 = 1$. All other terminal positions have utility O. For non-terminal positions, use a linear function defined as $Eval(s) = 3X_2(s) + X_1(s) – (3O_2(s) + O_1(s))$.

   (a) Approximately how many possible games of tic-tac-toe are there ?

   (b) Show the whole game tree starting from an empty board down to depth 2, taking symmetry into account.

   (c) Mark on your tree the evaluations of all the positions at depth 2.

   (d) Circle the nodes at depth 2 that would not be evaluated if alpha-beta pruning were applied, assuming the nodes are generated in the optimal order for alpha-beta pruning.

7. What are different types of Neural Networks ? Explain.

8. What are Intelligent Agents ? Explain different types of Intelligent Agents.

9. Given the full joint distribution below in Fig. (a), calculate the following :

(a) P (toothache)

(b) P (cavity)

(c) P (toothache / cavity)

(d) P(cavity / toothache V catch)

	Toothache		¬ Toothache	
	Catch	¬ Catch	Catch	¬ Catch
Cavity	0.108	0.012	0.072	0.008
¬ Cavity	0.016	0.064	0.144	0.576

Fig. (a)