* R M - 7 7 0 7 / 1 0 0 *

RM-7707

B. E. IV (Sem. VIII) (Computer) Examination

May / June – 2010

Elective - I (Artificial Intelligence & Robotics)

Time : 3 Hours] [Total Marks : 100

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 4 (Sem. 8) (Computer)**

Name of the Subject :

☛ **Elective - I (Artificial Intelligence & Robotics)**

☛Subject Code No. : 7 7 0 7 ☛Section No. (1, 2,.....) : 1&2

Seat No. :

Student's Signature

(2) Use **separate** answer sheet for each section.
(3) Make assumptions wherever required.
(4) Numbers on the **right** side indicate marks.

SECTION – I

Q:1(A) Attempt from following: 10

1. An association of Atoms with proposition is called denotation. True/False?
2. Ways by which we can produce additional Wffs from other ones are called _____.
3. Predicate calculus resolution is sound. True/False?
4. _____ is a theory of how to represent the kinds of knowledge about events that is usually contained in Natural Language Sentences.
5. Which of the following is not one of the phases of Natural Language Processing?
   [a] Semantic Analysis [b] Discourse Integration
   [c] Language Analysis [d] Morphological Analysis
6. Resolution produces proofs by _____.
7. Frame is a collection of attributes and _____.
8. A Horn clause is a clause that has _____ positive literals.
9. Name the knowledge representation scheme in which information is represented as a set of nodes connected to each other by a set of labeled arcs.
10. As far as Expert system is concerned, in which data structure, the set of rules are defined?

Q:1(B)

1. Define the following terms: 5
   i) Knowledge Base
   ii) Intelligent Agent
   iii) Facts
   iv) Inference
   v) Rule Base

2. Can a machine think? Discuss the method by which we can determine whether a machine or a program we have constructed exhibits intelligent behavior. 5

Q:2(A) Discuss the knowledge representation scheme that describes a stereo typed sequence of events in a particular context. Support your answer with appropriate illustration. 8

(B) What is an Augmented Transition Network? Show an ATN for fragment of English. Trace the execution of it as the following sentence is parsed. 7
"The fat boy has eaten the chocolates."

OR

Q:2(A) Discuss the process of converting any wff in propositional logic to Clause Form. Using this process, Determine the clause form for a wff given as : - $\neg[((P \supset \neg Q) \supset R) \supset (P \wedge R)]$. Clear the differences between Forward Reasoning and Backward Reasoning from your perspective. 8

(B) What is the usefulness of Unification Algorithm? "Unification forms the basis for resolution in predicate calculus." Do you agree with this sentence? Justify your answer. State and Explain the Unification algorithm. 7

Q:3 Attempt from the following: (Any Three) 15

1. Enlist and Explain various Phases involved in Natural Language Processing.
2. Write short note on Frames as a knowledge representation scheme.
3. Discuss Robotics along with its applications.
4. Explain various rules of inference in propositional and predicate calculus.
5. Write a short note on Expert systems and its Applications

SECTION – II

Q:4 Attempt any THREE from following : 18

1 Discuss : "Genetic Algorithm Vs Traditional methods"

2 Prove each of the following statements :
- i. Breadth First Search is a special case of uniform cost search.
- ii. Random search is a special case of A* algorithm
- iii. Uniform cost search is a special case of A* algorithm.

3 Consider a finite tree of depth d and branching factor b. Suppose the shallowest (lowest) goal node is at depth g <= d.
Discuss optimality, completeness, time complexity and space complexity criteria of depth first search, breadth first search, uniform cost search and iterative-deepening search in terms of b,d and g.

4 What is α Cutoff and β Cutoff? Explain benefits of it in searching. Also give one example for the same.

Q:5 Attempt following :

1 Give name of the algorithm that results from each of the following special cases and justify your answer : 4
- i. Genetic algorithm with population size N = 1
- ii. A* algorithm with value of h = 0 and g = 1

2 What is Fuzzification? What is membership function? 4

3 Discuss all problem characteristics for the following problem 4
- i. Chess
- ii. 8-puzzle

4 Give one example for which, Breadth First Search is not complete. Also give one example for which, Depth first is complete. Support your example with proper explanation. 4

OR

Q:5 **Attempt following :**

1 Give a simple example to show that if the state evaluation function returns very high values, the search will not necessarily find the optimal solution. **4**

2 Short note : Learning in Artificial Neural Network **4**

3 Perform the Minimax algorithm on the tree given in **Figure 1**., first without and later with αβ-pruning. Comment on your answer. **8**

Q:6 1 **Attempt following:** **10**

i. Can solution steps be ignored in 8 puzzle problem?
ii. Give example of certain outcome problem.
iii. Give example of uncertain outcome problem
iv. For TSP problem, Is the solution a state or a path?
v. For Chess problem, Is the solution a state or a path?
vi. Does chess problem to solve require interaction with a person?
vii. Does Expert system require interaction with a person?
viii. A Machine (computer system) can think. True/False ?
ix. Fuzzy logic is inspired from Darwin's law. True/False?
x. Bayesian network and Fuzzy logic can be used interchangeably. True/False?

2 What will be Encoding, Fitness and selection strategy for the following problem to solve using Genetic Algorithm? Discuss in detail. **6**

$F(x_1,x_2) = 5x_1^2 - 3x_1x_2^2 + x_2^3 - 17x_1$

Maximize $F(x_1,x_2)$ such that :

$0 <= x_1 <= 50$ and

$0 <= x_2 <= 4$

Figure : 1