**CS/MCA/Odd/Sem-3rd/MCA-303/2015-16**

# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

# MCA-303

## INTELLIGENT SYSTEM

Time Allotted: 3 Hours                                                          Full Marks: 70

*The questions are of equal value.*
*The figures in the margin indicate full marks.*
*Candidates are required to give their answers in their own words as far as practicable.*
*All symbols are of usual significance.*

### GROUP A
### (Multiple Choice Type Questions)

1.    Answer *all* questions.                                                   10×1 = 10

   (i) What is Artificial Intelligence?

      (A) Putting your intelligence into computer

      (B) Programming with your own intelligence

      (C) Making a machine intelligent

      (D) Playing a game

      (E) Putting more memory into computer

   (ii) Which is not the commonly used programming language for AI?

      (A) PROLOG                  (B) Java

      (C) LISP                    (D) Perl

      (E) Java script

(iii) What is state space?

(A) The whole problem

(B) Your definition to a problem

(C) Problem you design

(D) Representing your problem with variable and parameter

(E) A space where you know the solution

(iv) A production rule consists of

(A) a set of Rule

(B) a sequence of steps

(C) both (A) and (B)

(D) arbitrary representation to problem

(E) directly getting solution

(v) Which search method takes less memory?

(A) Depth-first search      (B) Breadth-first search

(C) Both (A) and (B)      (D) Linear search

(E) Optimal search

(vi) A heuristic is a way of trying

(A) to discover something or an idea embedded in a program

(B) to search and measure how far a node in a search tree seems to be from a goal

(C) to compare two nodes in a search tree to see if one is better than the other

(D) only (A) and (B)

(E) only (A), (B) and (C)

(vii) A* algorithm is based on

(A) Breadth-first-search      (B) Depth-first-search

(C) Best-first-search      (D) Hill climbing

(E) Bulkworld problem

(viii) Which is the best way to go for game playing problem?

(A) Linear approach      (B) Heuristic approach

(C) Random approach      (D) Optimal approach

(E) Stratified approach

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(ix) How do you represent "All dogs have tails"?

(A) $^\forall$x: dog(x) →hastail(x)    (B) $^\forall$x: dog(x) →hastail(y)

(C) $^\forall$x: dog(y) →hastail(x)    (D) $^\forall$x: dog(x) →has→tail(x)

(E) $^\forall$x: dog(x) →has→tail(y)

(x) Which is not a property of representation of knowledge?

(A) Representational verification    (B) Representational adequacy

(C) Inferential adequacy    (D) Inferential efficiency

(E) Acquisitional efficiency

## GROUP B
### (Short Answer Type Questions)

Answer any *three* questions.                                     3×5 = 15

2. (a) Why DFS is not always complete? Explain with appropriate example.     2
   (b) Justify each of the following statements:                             3
       (i)   BFS is a special case of Uniform-cost search.
       (ii)  Uniform-cost search is a special case of A* search.
       (iii) DFS can be viewed as a special case of Depth-limit search.

3. (a) What do you mean by Zero-sum game?                                     1
   (b) Define Alpha-cut and Beta-cut of a game tree with suitable example.    4

4. (a) Draw the semantic net for the following sentence:                      3
           "Every dog has bitten a mail carrier".
   (b) Differentiate between inheritable knowledge and inferential knowledge. 2

5. (a) State "Modus Ponen Rule". Prove that this formula is valid or tautology. 3
   (b) Convert any two of the following sentences into First-Order Logic:     2
       (i)   There is a mushroom that is purple and poisonous.
       (ii)  Every child who has a toy-car is cool.
       (iii) Samir is a boy.

6. (a) What do you mean by admissibility and consistency of a heuristic function? 2

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(b) The heuristic function 'sum of Manhattan distances' for 8-puzzle problem is consistent-validate the statement giving brief explanation. 3

## GROUP C
### (Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. What is an environment? Discuss briefly the different types of environment. Differentiate between informed search and uninformed search techniques. What is monotonic reasoning? 2+6+5+2

8. What do you mean by a rational agent? Give a comparative study of the different uninformed search techniques w.r.t time and space complexity. Explain depth first search algorithm with a highlight on the implementation itenaries. 3+5+7

9. Analyze the Missionaries and Cannibals problem which is stated as follows. 3 missionaries and 3 cannibals are on one side of the river along with a boat that can hold one or two people. Find a way to get everyone to the other side, without leaving a group of missionaries in one place out-numbered by the cannibals in that place. 8+7
   (i) Formulate a problem precisely making only those distinctions necessary to ensure a valid solution. Draw a diagram of the complete state space.
   (ii) Discuss an appropriate search algorithm for it.

10. Differentiate between predicate logic and propositional logic. Discuss heuristic search as a method of solving problems. Elaborate with an example the working principle of A* algorithm. 4+3+8

11. Write short notes on any *three* of the following: 3×5
    (a) Expert systems
    (b) Resolution in first order predicate logic
    (c) Semantic network
    (d) Planning Graphs
    (e) Natural Language Processing.

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