University of Engineering & Management, Kolkata

End Semester Examination, December, 2018

Course: B.Tech(CSE) Semester: 7th

Paper Name: Artificial Intelligence

Paper Code: CS701

Full Marks: 70 Date: 11/12/2018 Time: 2.00pm – 5.00pm

Group A (10 marks)

Answer any 5. Each question is of 2 marks

1. **A)** Define Artificial Intelligence formulated by Haugeland.
   B) Differentiate BFS & DFS.
   C) What are the components of Propositional Logic?
   D) Define AND –Elimination rule in propositional logic.
   E) What are Planning Graphs?
   F) What is Induction heuristics?
   G) Does the minimax algorithm need to reach a terminal state to find a solution?
   H) What is the use of Fuzzy set theory?

Group B (15 marks)

Answer any 3. Each question is of 5 marks

2. What is the role of communication for an intelligent agent?
3. Write pseudo-code agent programs for the goal-based agents.
4. Give the name of the algorithm
   i. Local beam search with k=1
   ii. Local beam search with one intial state and no limit on the number of states retained.
5. What two requirements should a problem satisfy in order to be suitable for solving it by a GA?
6. What is Theorem of Nobel Laureate Harsanyi ?

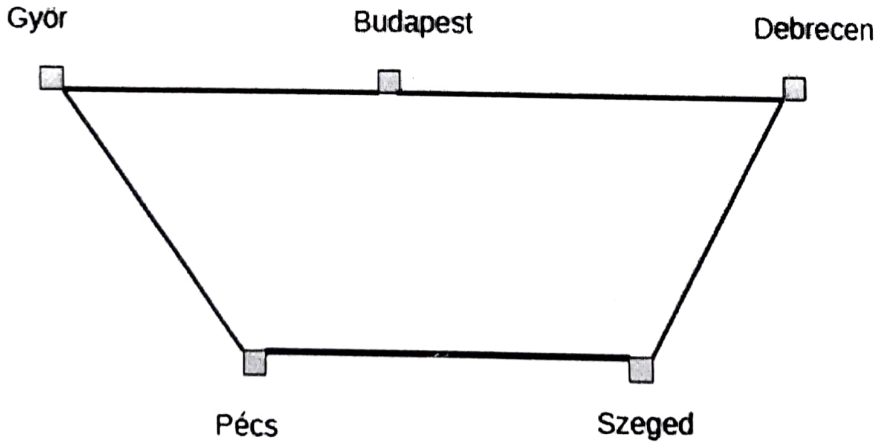
7. Represent each of the following pieces of knowledge by a semantic net :
   i) Loves (mary, john)
   ii) Loves (mary, john) ∧ Hates (john, mita)
   iii) Loves (mary, john) → Hates (mita, john).

Group C (45 marks)

Answer any 3. Each question is of 15 marks

8. Categorize the following problems problem into ignorable, recoverable or irrecoverable problems:
   i. Water Jug
   ii. 8-puzzle
   iii. Chess
   iv. Theorem proving (15)

9. Consider the following search problem. The set of states corresponds to a set of cities on the map of Hungary below (the state Budapest corresponds to being in Budapest, etc.). Actions correspond to following an edge (driving along the road) from one city to another. All actions apart from two are deterministic and have the expected result, namely driving from X to Y results in being in Y . The only exceptions are actions which involve driving out of Gy¨or: the action of driving from Gy¨or to Budapest has two possible outcomes, one being in Budapest and another being in P´ecs. Similarly, the action of driving from Gy¨or to P´ecs also has two possible outcomes, one being in Budapest and another being in P´ecs. The initial state is being in Gy¨or and the goal is to reach Szege.



(15)

10. Give the execution trace of Depth Limited Minimax employing Alpha-Beta pruning with depth-limit=2 and root-node=A and Quiescence Search with QSdepth-limit=1 (QSABDLM(A,2,1,$-\infty$, ∞)).
    Define: DLM = QSABDLM, MinV = QSABMinV, MaxV = QSABMaxV (15)

11. Consider the following 8-puzzle problem :

Given the critical state :

2 8 3

1 4

7 6 5

and Goal the state :

1 2 3

8 4

7 6 5

i) List the operators.

ii) Select a heuristic function for the 8-puzzle problem.

iii) Solve the problem by A! algorithm with your selected heuristic function. **(15)**

12. EvilRobot has two dogs called Fido and Fifi: All three of them enjoy pie and sausages so much that they like to steal them. At the beginning of the day the butcher has some sausages and the pieShop has some pie. Also, EvilRobot and his pets are at home, but they aim to end the day having relieved the local businesses of their products.

i. Give a detailed definition of a Constraint Satisfaction Problem (CSP). Include in your answer a definition of what it means for an assignment to be consistent and to be complete, and for an assignment to be a solution.

ii. Consider the constraint C on four variables {V1, V2, V3, V4} each of which has the domain {true, false}, with

C = {(true, true, true, true)

(true, false, true, false)

(false, true, false, false)

(false, false, false, true)

(false, false, true, true)}.

Explain how this constraint can be replaced by a collection of binary constraint shaving an identical effect.

iii. Describe the state-variable representation for planning problems. Illustrate your answer by showing how the action of EvilRobot (or one of his pets) stealing something could be represented in the scenario set out at the beginning of this question. **(15)**

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