



EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
THIRD EXAMINATION IN SCIENCE -2013/2014
FIRST SEMESTER (May /June, 2016)
CS 304 – ARTIFICIAL INTELLIGENCE
PROPER & REPEAT



ANSWER ALL QUESTIONS

TIME ALLOWED: TWO HOURS

Q1)

- a) What do you mean by *Artificial intelligence (AI)*?
- b) Briefly describe the four approaches to defining the AI systems.
- c) Clearly explain the *rational agents* in AI.
- d) Give the PEAS description of the following rational agents in AI:
 - i. Self-driving car
 - ii. Medical diagnosis system
 - iii. Chess player.
- e) Describe the properties of the following task environments in AI:
 - i. Crossword puzzle
 - ii. Chess with a clock
 - iii. Chess without a clock.

Q2)

- a) Define the following terms:
 - i. State
 - ii. State Space
 - iii. State Space Search.
- b) Give an example problem for which breadth first search would work better than depth first search.
- c) Discuss the drawbacks while you apply the *Hill-climbing* heuristic searching technique to solve the AI problems.

- d) The puzzle consists of a 3×3 grid with the numbers from 1 to 8 on tiles and one empty square. Tiles can be slid within the grid and it can move into the empty square adjacent to the empty square. Initial and the goal states of the puzzle are given. Apply *Hill-climbing* and *A* search* heuristic techniques separately to find the solution and illustrate the solutions using state space graph.

Initial state

1	2	3
8	5	6
4	7	

Goal state

1	2	3
4	5	6
7	8	

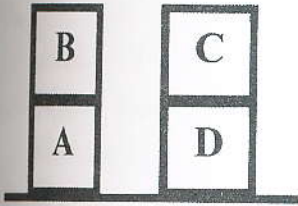
- e) Briefly explain about AO* algorithm with suitable example.

Q3)

- a) Briefly describe the “Knowledge Representation” in AI.
- b) Convert the following facts to “Predicate calculus”.
- Every gardener likes the sun.
 - You can fool some of the people all of the time.
 - You can fool all of the people some of the time.
 - All purple mushrooms are poisonous.
 - No purple mushroom is poisonous.
 - Clinton is not tall.
- c) I married a widow W who has a grown-up daughter D. My father F, who visits often, fell in love with my step daughter and married her. Hence, my father became my son-in-law and my step-daughter became my mother. Some months later, my mother gave birth to a son S1, who became the brother-in-law of my father, as well as my step-son. My wife of my father, that is, my step daughter, also had a son S2.
- Using predicate calculus create a series of expressions that represent the above story.
 - Add expressions defining basic family relations such as the definition of father and use modus ponens on this system to prove the conclusion that “I am my grandfather”.

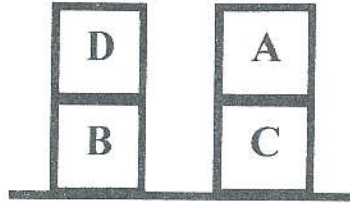
(4)

- Define the term *planning* in AI.
- Explain the concept of *Goal Stack Planning*.
- Write the precondition, add list and delete list for each operator of the *STRIPS* in the blocks world problem.
- Consider the following blocks world problem.



Initial State

$ON(B, A) \wedge ON(C, D) \wedge$
 $ONTABLE(A) \wedge ONTABLE(D) \wedge$
ARMEMPTY



Goal State

$ON(D, B) \wedge ON(A, C) \wedge$
 $ONTABLE(B) \wedge ONTABLE(C)$

Show how *Goal Stack Planning* may be used to solve the above block world problem.