Nirma University

Institute of Technology

Semester End Examination (RPR), May - 2019

B. Tech. in Computer Engineering, Semester-VII

IT724 Artificial Intelligence

Roll/ Exam No | Supervisor's initial with date

Time: 3 Hours | Max Marks: 100

Instructions:

1. Attempt all questions.
2. Figures to the right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Assume necessary data wherever required and state the assumptions.

SECTION-I

Q:1 **Do as Directed.** **[14]**

A CO-1, BL-2 List all the issues in hill climbing. Write down corrective measures to encounter them. [04]

B CO-1, BL-1 Explain the importance of search space. Differentiate the terms breadth first search and depth first search. [04]

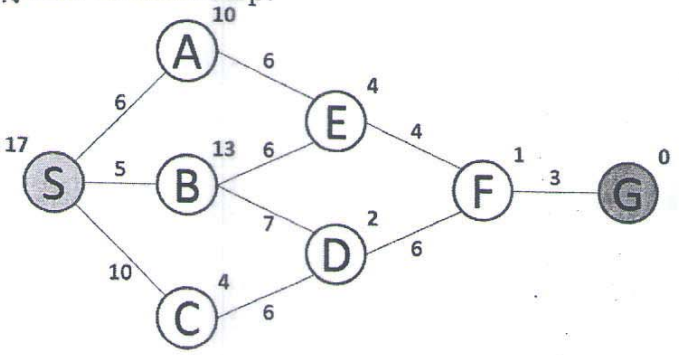
C CO-3, BL-3 Consider following board structure and Turn for tic-tac-toe problem. Board: a nine element vector. Consider 2[blank], 3[X] and 5[O]. Turn: integer indicating which move of the game is about to be played. Write main sub procedures to solve the above problem. [06]

OR

C CO-1, BL-2 Define Artificial Intelligence. Classify AI task domain into formal task, mundane task and expert task. [06]

Q:2 **Do as Directed** **[20]**

A CO-2, BL-4 Perform the A* algorithm on following figure. Explicitly write down queue at each step. [06]



B CO-2, BL-6 Apply the Constraint satisfaction procedure for solving following cryptarithmatic problem - [08]

```
    H A C K
+   H A C K E R
-------------
  R E B O O T
```

OR

B CO-2, BL-6 Apply the Constraint satisfaction procedure for solving following cryptarithmatic problem - [08]

```
    D O N A L D
+   G E R A L D
-------------
  R O B E R T
```

C CO-3, BL-3 You are given two jugs, a 4-gallon one and a 3-gallon one. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly two gallons of water into 4-gallon jug? Define the state space first and solve the prolem. [06]

Q: 3 **Answer the following questions** **[16]**

A CO-3, BL-4 Analyze 8-puzzle problem with respect to seven problem characteristics. [08]

B CO-1, BL-5 For each of the following problems, define only heuristic function in a precise way: [08]
1) Blocks world problem
2) Missionaries and cannibals problem

SECTION-II

Q:4 **Do as Directed:** **[14]**

A CO-1, BL-3 What is the basis of the resolution? Assume the following facts : [04]

i) If a person is happy then he is either rich or saint.
ii) It is necessary to be happy for being healthy.
iii) John is healthy.
iv) John is not saint.

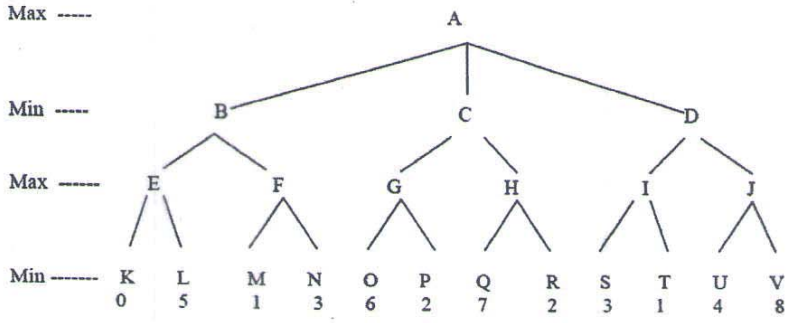
Convert each of the statement in predicate logic and use resolution to prove or disprove that "John is rich".

B CO-1, BL-2 Critically discuss the following terms in the context of Uncertainty [04]
(i) Statistical reasoning
(ii) Symbolic reasoning

C CO-1, BL-2 Draw and explain Architecture of a typical Expert System with functionalities of each module. [06]

Q:5 Do as Directed **[20]**

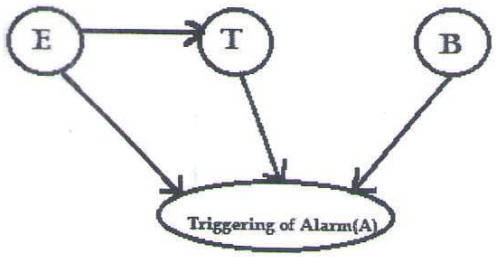
A CO-2, BL-6 Consider the following game tree in which static scores are all from the first player's point of view: [10]



(1) Suppose the first player is a maximizing player. What move should he choose?
(2) Use alpha-beta pruning to show that which nodes need not to be examined.

OR

A CO-2, BL-5 Consider an alarm system installed in a house that can be triggered by three events, namely earthquake, burglary, and tornado. This situation can be modeled with the help of Bayesian network as shown in following figure and table: [10]



Find Out:
1) Joint probability of all the events.
2) What is the probability that it is an earthquake, given the alarm is ringing?
3) What is the probability that it is an earthquake, given that there is a tornado?
P(E) =0.4 P(B) =0.7

E	P(T)
T	0.8
F	0.5

E (Earthquake)	B (Burglary)	T (Tornado)	P(A) Alarm
T	T	T	1.0
T	T	F	0.9
T	F	T	0.95
T	F	F	0.85
F	T	T	0.89
F	T	F	0.7
F	F	T	0.87
F	F	F	0.3

B CO-2, BL-2 Briefly describe the phases that are needed to understand natural language processing. [05]

C CO-3, BL-3 Mention the problems that typically occurs in Mini-max search procedure in game playing. Describe the techniques to refine the performance of Mini-max procedure. [05]

Q: 6 Answer the following questions: **[16]**

A CO-2, BL-6 Think that you are given a specific real world problem and you are building a system to solve that problem using an AI technique. Which are the steps needed to build a system in order to solve a particular problem? [08]

B CO-3, BL-3 Write programs for following in PROLOG: [08]

1) Program that splits the input list of numbers into two output list consisting positive numbers and negative numbers separately.
2) Inserting an element at a desired position into the list of given numbers.