Nirma University

Institute of Technology

Semester End Examination (IR/RPR) December – 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 right indicate full marks.
3. Use section-wise separate answer book.
4. Draw neat sketches wherever necessary.
5. Assume suitable information(if required) and mention the same.

SECTION I

Q.1 **Answer the following questions, do as directed :** **[3X6=18]**

CO1, L1

(a) What factors decides the choice of reasoning between forward and backward ? Discuss.

(b) Explain the term Combinatorial Explosion. Give two examples of A.I. problems which possesses problem of combinatorial explosion.

(c) What is Production System ? What are its constituents ? Mention the requirements of a good control strategy.

(d) When would Best First Search be worse than Simple Breadth First Search.?

(e) What do you mean by Graceful Decay of Admissibility with regards to A* algorithm.

(f) Differentiate between DFS & BFS on the following grounds –
a) Memory requirement b) Time to search for goal
b) Guarantee of getting goal d) Optimal solution

Q.2 **Answer the following questions.** **[2x8=16]**

(a) Solve the following Cryptarithmetic problem.

CO2, L5

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  ROBERT
+ GERALD
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 DONALD
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(b) Consider the problem of Missionaries and Cannibals :

CO2, L2

i) Analyze this problem based on seven problems characteristics.
ii) Give state space representation of the same.

OR

(b) CO2, L2 Considering the problem of water jug problem having two jugs of water having 4 liters' and 3 liters' capacity and no marking for measurements. Objective is to fill 2 liters' of water in 4 liters' of jug. Assume that you have been given a pump to fill the water, you can pour the water from one jug to another and throw the water on to the ground.

1) Give the state space representation
2) One solution stating the production rules applied.

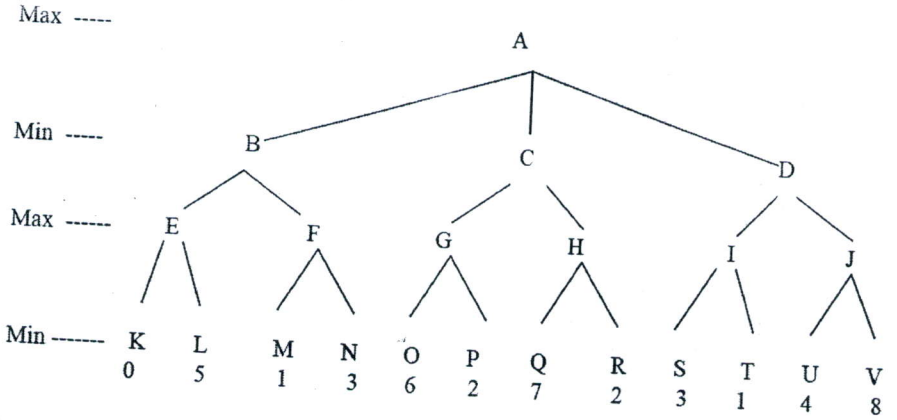
Q.3 **Answer the following questions.** **[16]**

(a) CO2, L2 Discuss the following production systems with their applicability: [06]

1) Monotonic
2) Non-monotonic
3) Partially Commutative
4) Commutative

OR

(a) CO2, L5 Consider the following game tree in which static scores are all from the first player's point of view: [06]



(1) Suppose the first player is a maximizing (Max) player. What move should be chosen?

(2) Use alpha-beta pruning to show that what nodes need not to be examined.

(b) CO3, L3 Convert the following English sentences into wff using FOPL

i. Mary likes anybody who likes to play chess.
ii. People only try to assassinate rulers they are not loyal to. [06]
iii. John is sure to carry an umbrella when it rains.
iv. All yellow mushrooms are poisonous.

(c) CO1, L1 In the context of FOPL (First Order Predicate Logic) discuss the following inference rules : [04]

i) Modus Ponen ii) Modus Tollen iii) Chain Rule iv) Principle of Resolution

SECTION - II

Q.4 **Answer the following questions.** **[18]**

(a) CO2, L3 Discuss the potential problems present in Simple Hill Climbing, give remedial measures of these problems, Is Steepest Ascent Hill Climbing is [06]

better ? Justify.

(b) CO2, L4 Discuss A* Algorithm giving effects of underestimation and overestimation of estimated cost of traveling from current state to goal state on the performance of algorithm. [06]

(c) CO3, L6 Write a PROLOG program to perform following operation on list : i) membership of an element in the list ii) concatenation of two lists. [06]

Q.5 **Answer the following questions.** **[16]**

(a) CO2, L3 Consider following search space. In this state space assume that A is the starting state and G is the goal state. Trace A* algorithm and show contents of open and close queue. [08]]

State	Next	Path Cost	State	Heuristic Function Value
A	B	4	A	8
A	C	1	B	8
B	D	3	C	6
B	E	8	D	5
C	C	0	E	1
C	D	2	F	4
C	F	6	G	0
D	C	2		
D	E	4		
E	G	2		

(b) CO3, L3 Consider the following statements - [08]

- Gandhi nagar is capital of Gujarat.
- Gujarat is in India.
- Ahmedabad is in Gujarat.
- All states have only one capital each.
- Govt. of a state takes place in its capital.

Convert above statements in formal logic. Is this knowledge base complete to answer the following queries ? If not, what additional knowledge must be included ? Use resolution principle.
(i) Is Gujarat a state ? (ii) Is Ahmedabad in India ? (iii) Is Ahmedabad capital of Gujarat ? (iv) Where does the govt. of state Gujarat takes place?

OR

(b) CO3, L3 Give two examples of problem having following characteristic- [08]

(i) Decomposable (ii) Recoverable
(iii) Irrecoverable (iv)Universal predictability
Justify your answer.

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

(a) CO1, L2 Describe the following : [06]

i) Monotonic and Non Monotonic Reasoning
ii) Circumscription
iii) Abduction iv) Closed World Assumption

(b) CO1, L2 Mention all the types of Knowledge. Discuss following knowledge representation tools and their appropriate suitability: [04]

1) Frames
2) Semantic Nets

OR

(b) CO2, L3 Using Dempster-shafer theory, derive new probabilistic sets for below given sets of m. [04]

m1 = {Abbott, Babbitt} (0.8) {beneficiaries in will}
Θ (0.2)
m2 = {Abbott, Cabot} (0.7) {in line for his job}
Θ (0.3)

(c) CO3, L3 Discuss the architecture of a typical Expert System. Write significance of an Expert System Shell. Give two examples of well known Expert System. [06]