Nirma University

Institute of Technology

Semester End Examination (IR) December – 2016

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.

SECTION I

Q.1 Answer the following questions. **[18]**

(a) Discuss the significance of Production System and list its constituents. Mention the requirements of a good control strategy. [06]

(b) Consider 8-Puzzle Problem:- [06]
- i. Analyze the problem with respect to seven problem characteristics and discuss.
- ii. Give the State Space representation of the problem.

(c) Critically discuss the Simulated Annealing method and its applicability. [06]

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

(a) i) State the "Physical Symbol System Hypothesis". Is it always true? Justify your answer. [08]

ii) Discuss effect of underestimation and overestimation of estimated cost given 'by heuristic function on the performance of A* Algorithm. .

(b) Solve the following Crypt Arithmetic problem, using Constraint Satisfaction method. Mention the steps involved: [08]

```
  CROSS
+ ROADS
  .....
 DANGER
```

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

(a) There are four cold drink bottles A, B, C, and D (Ajay, [08]

Benjamin, Cacilda, and Devang). They can be arranged in any order from left to right, except that bottle A can never be further to the right than bottle D. For example, ABCD, CBAD, and CADB are possible states of our world, whereas DCBA, CDAB, or BCDA can never occur. The world can be manipulated by the schema swap(x, y), which swaps the bottles in positions x and y. For example, swap (1, 2) turns state BCAD into CBAD.

However, swap(1, 2), swap(2 , 3), and swap(2 , 4) are the only three available operators.

Draw the state - space graph of this scenario. You do not need to draw any bottles; just use four - letter sequences to describe states.

OR

(a) Consider the following statements - [08]

- Gandhinagar 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 to answer following queries :
(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?

(b) Give an example of problem for which breadth-first search would work better than depth-first search. [02]

OR

(b) Precisely discuss, what Combinatorial Explosive problem is? Give an example. [02]

(c) Discuss how First Order Predicate Logic (FOPL) is powerful than propositional logic in knowledge representation and inference. What are the features which makes it fail in handling uncertain situation? [06]

SECTION II

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

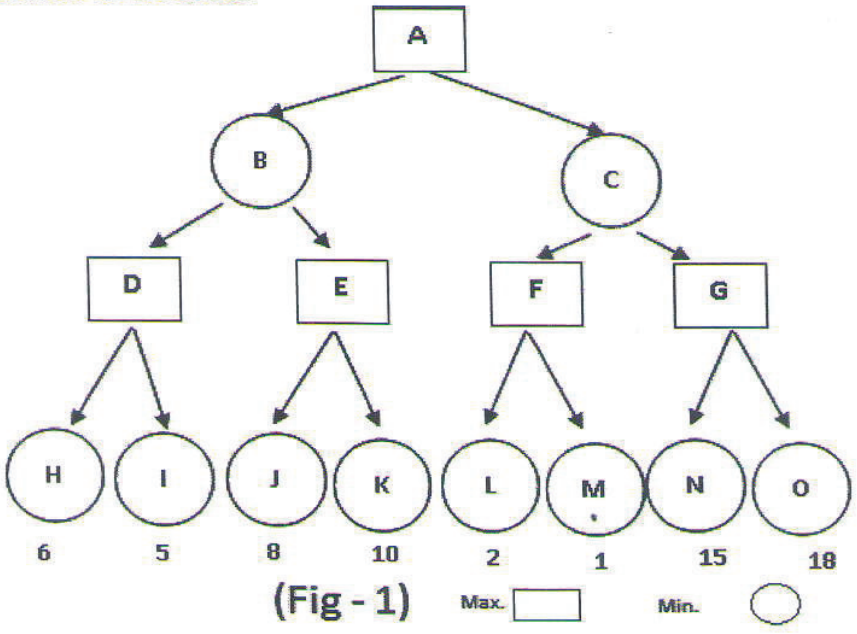
(a) What are architectural components of an Expert System? Write significance of Expert System Shell? Differentiate between rule based and model based expert system. Give two names of well-known expert system. [08]

OR

(a) Differentiate between the following terms : [08]

i) Connectionist AI and Symbolic AI.
ii) Supervised and Unsupervised Learning
iii) Monotonic and Non-Monotonic Logics
iv) Linearly and Non-linearly separable problems with example

(b) Given the following search tree (Fig-1), apply the Min-Max search algorithm with alpha-beta pruning to it and show the search tree that would be built by this algorithm. Make sure that, you also need to show where the alpha and beta-cuts offs are applied and which parts of the search tree are pruned as a result. [10]



(Fig - 1)

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

(a) Show Semantic Network representation for the following : [08]

- All the students are attempting an AI question paper.
- All the students attempt all the questions.

How can a relation between a student and a teacher teaching AI can be established using above semantic network representation?

(b) Critically discuss the applicability of 'frames' as one of the knowledge representation tool. Justify your answer. Under what circumstances 'Scripts' are advisable to use? [08]

OR

(b) What are the ambiguity problems in Natural Language Understanding? What are the techniques to resolve these problems? (08)

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

(a) Discuss Certainty Factors how they are applicable in Rule-Base Systems with an example (04)

(b) Describe in brief various steps involved in processing Natural Language Sentences (Assume 'English' as Natural Language). (04)

(c) Critically discuss the 'Bayes Theorem. How it is applicable to diagnostic kind of application domain. Justify your answer giving an example. [08]