Nirma University

Institute of Technology

Semester End Examination (IR), May - 2018

B. Tech. in Computer Engineering, Semester-VII

2IT421 Artificial Intelligence and Expert Systems

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. Draw neat sketches wherever necessary.
4. Assume suitable data wherever necessary and mention the same.

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

(A) Define the following terms: [12]

(i) Intelligence (ii) Artificial Intelligence

(iii) Graceful decay of admissibility (iv) Logical Reasoning

(v) Rationality (vi) Agent

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

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

(A) Discuss Constraint Satisfaction Problem (CSP) approach. List some real life applications of CSP. Apply the same for solving the following cryptarithmatic problem: {Show All steps precisely} [10]

```
  SEND
+
  MORE
----------
 MONEY
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Constraints for above mentioned cryptarithmatic problem are:

- No two digit can be assigned to same letter.
- Only single digit number can be assigned to a letter. i.e (between 0 to 9)
- No two letters can be assigned same digit.
- Assumption can be made at various levels such that they do not contradict each other.
- Any of search techniques may be used.
- Backtracking may be performed as applicable to the applied search technique.
- Rules of arithmetic must be followed.

OR

(A) There are four cold drink bottles A, B, C, and D (Ajay, 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 [10]

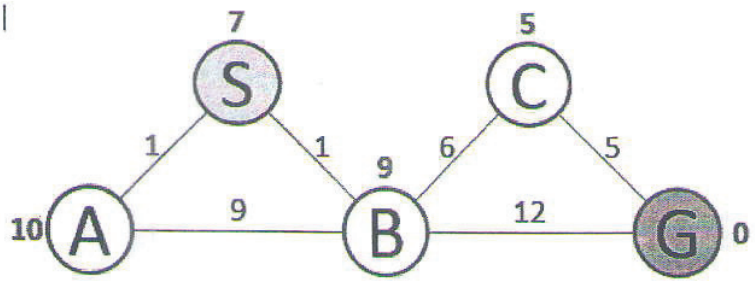
our world, whereas DCBA, CDAB, or BCDA can never occur. The world can be manipulated by the schema swap(x, y), which swaps the bottles in positions x and y. For example, swap (1,2) turns state BCAD into CBAD. However, swap(1, 2), swap(2 , 3), and swap(2,4) are the only three available operators.
Draw the state - space graph of this scenario. You do not need to draw any bottles; just use four - letter sequences to describe states.

(B) Compare and contrast Predicate Logic and Propositional Logic. [06]

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

(A) Solve 8-Queens problem using constraint satisfaction. Explain each step. [08]

(B) Show the tracing of finding goal state from below given graph using A* algorithm. Given Graph is undirected and has 5 nodes. consider S as start state and G as Goal state. Every node is labeled with its heuristic value. [08]



Q-4. Answer the following. **[16]**

(A) Aladdin finds two trunks labeled T1 and T2 in a cave. He knows that each of them contain either contains a treasure or a fatal trap. [6]
There are two messages on trunks:

- At least one of these two trunks contains a treasure.
- In T1 there is a fatal trap.

Aladdin knows that either both the messages are true or they are both false.
Which trunk Aladdin should open to get treasure?

(B) Consider the following sentences: [6]

1. All actors and journalists invited to the party are late.
2. There is at least a person who is on time.

Formalize above sentence using First Order logic, and prove that sentence "There is at least an invited person who is neither a journalist nor an actor" is not logical consequence of statements 1 and 2.

(C) Differentiate between the following terms: [4]

i) Monotonic and Non-Monotonic Logics
ii) Statistical reasoning and Symbolic reasoning

Q-5. Answer the following. **[18]**

(A) Formalize following sentence into propositional language [06]

i) "David comes to the party if and only if Carlo comes and Angelo doesn't come"
ii) "IF David comes to the party, then , if Carlo doesn't come then Angelo comes"

OR

(A) What are issues in processing Natural Language Sentences? How it can be resolved? [06]

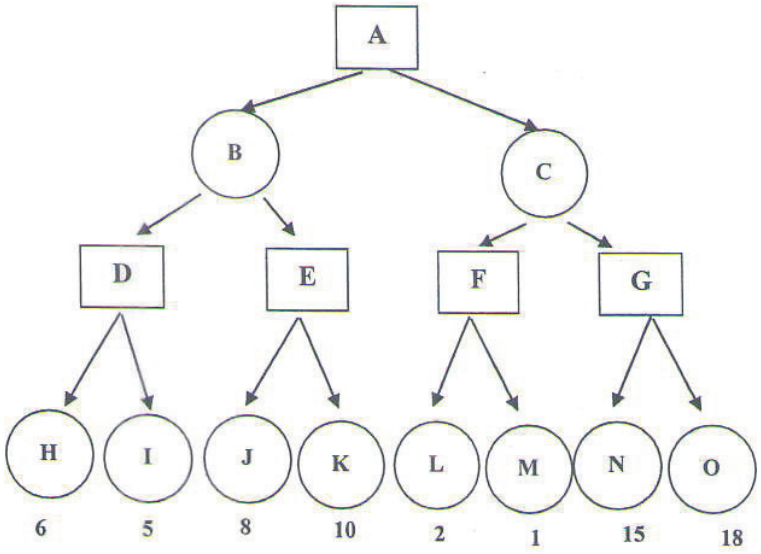
(B) Construct semantic net representation for following: [04]

(i) Book1 is authored by A1
(ii) Book2 is authored by A2
(iii)Book3 is authored by A1
(iv) Book1 is edited by E1
(v) Book2 is edited by E1
(vi)Book2 is edited by E2
(vii) Book2 is proceeding book.
(viii) A1 has email id a1@nit.ac.in
(ix) A2 has email id a2@nit.ac.in
(x) E1 has email id E1@nit.ac.in
(xi)E2 has email id E2@nit.ac.in

(C) Discuss architecture of typical Expert System. What is role of Knowledge engineer in building expert system? [08]

OR

(C) Consider the following game tree in which static scores are all from first player's point of view: [08]



(i) Suppose the first player is a maximizing (Max) player, what move should be chosen? Why?
(ii) If both min and max play a perfect game, who will win? Justify your answer.

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

(A) What are steps involved in Natural Language processing? Briefly describe role of each step and relationship among steps. [06]

(B) Write a program in PROLOG to perform union operation of two lists List1 and List2 and store results into List3. [06]

(C) What are similarity and differences between semantic Net and Frames [04]