BE2-R3: ARTIFICIAL INTELLIGENCE AND APPLICATIONS

NOTE:

- 1. Answer question 1 and any FOUR questions from 2 to 7.
- 2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours Total Marks: 100

1.

- a) Why Backtracking (or depth-first-graph search) control strategies should be used when there are multiple paths between problem states. Explain your answer with the help of an example.
- b) Let Y and R be two fuzzy sets of young and rich people. What is the member grade of person being young and rich if the member grade of a person being young is 0.8 and being rich is 0.7?
- c) What are the desirable properties of Natural Language as a medium for human-machine interaction?
- d) What do you mean by planning? How it is useful in achieving goals and strategy?
- e) Define the term "pattern recognition" and "learning from experience" with respect to Neural Networks.
- f) A Bayesian Network is a graphical representation of a probability distribution. What are the advantages of it? How does Bayesian Network learn?
- g) The usefulness of current expert systems depends on their users having common sense and explanation facility. Justify the sentence by giving an example.

(7x4)

2.

- a) What do you understand by underestimation and overestimation of a heuristic function? Why is it must for the heuristic function to underestimate in case of A* algorithm.
- b) Prove each of the following statements:
 - i) Breadth First Search is a special case of uniform cost search.
 - ii) Random search is a special case of A* algorithm.
- c) State and explain unification algorithm. Trace the operation of unification algorithm on each of the following pairs of literals:
 - 1. P (x, f(x)) and P(y, y)
 - 2. P(g(f(v)),g(u)) and P(x,x)
- d) Differentiate between declarative and procedural knowledge.

(4+4+6+4)

3.

a) Trace the execution of the constraint satisfaction procedure in solving the crypt arithmetic problem:

LOGIC

LOGIC

PROLOG

- b) What do you mean by partitioned semantic nets? Draw the partitioned semantic net for "Andrew believes that the earth is flat".
- c) What are the components in which knowledge is composed in Expert System? Explain the formalization with reference to development cycle of an Expert System.

(10+4+4)

4.

- Explain in detail CUT and NEGATION facility in PROLOG.
- b) Enlist some features of language that make it both difficult and useful. Explain steps in NLP by giving examples in each.
- c) Write grammar rules, which can handle the following sentence and generates the parse tree for:

'I shoot the wumpus'.

d) Prove that means ends analysis technique could be used to solve the problem by combining forward and backward reasoning.

(4+7+4+3)

5.

- a) Justify the statement –"A game tree is basically an AND OR Graph."
- b) Why, there is a need to use a bias/threshold in Neural Network? What is the role of activation function in Neural Networks?
- c) Is it true that fuzzy logic does not obey the law of 'excluded middle'? Prove the sentence with example.
- d) Convert following sentences to propositional logic. Using the logical rules and proof by resolution; answer the question that "which course Steve would like?"
 - i) Steve only likes easy courses.
 - ii) Science courses are hard.
 - iii) All courses in the basketweaving department are easy.
 - iv) BK301 is a basketweaving course.

(5+3+3+7)

6.

 Write a complete prolog program for Define the Relation translate (List1, List2) to translate a list of numbers from 0 to 9 to a list of corresponding word.

E.G.

```
Translate ([3,5,1],[Three,Five,One])
Use the Predicate: means (0,Zero)
means (1,One)
```

b) Write a predicate intersect (List1, List2, List3) in prolog to find the common elements of List1 and List2 and generate List3 having common elements.

(9+9)

7.

a) Given the following initial and the goal state for the Blocks world problem. Construct a set of operators (Rules) and hence generate a plan to reach the goal state from the initial state.

```
Initial state: On (C, A),
Clear (C),
On (B, Table),
Clear (B).
Goal State: On (B, A),
On (C, B).
```

- b) What is the back propogation? Is it possible to use back propogation for batch training as well as incremental training? What should be the learning rate used for back propogation?
- c) Using the following rewrite rules, replace the numerals on the left hand side with the string of numerals on the right and using these rules to transform the numeral 6 into a string of 1's.