BE2-R4: ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS

NOTE:

1. **Answer question 1 and any FOUR from questions 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) What is artificial intelligence? What is the Turing test?
b) Explain the search space and problem space with the help of a suitable example.
c) Mention the possible solution(s) to the disadvantages of Hill Climbing search technique.
d) Justify the use of fuzzy logic in AI. Give real life example where fuzzy logic concept is used.
e) How are the frames organized? Why are the scripts required? Can it be considered as a variant of frames?
f) State the Most General Unifier for: W={ P(a,x,f(g(y))),P(z,f(z),F(u)))}
g) "Unsupervised learning is equivalent to cluster analysis." Comment.

(7x4)

2.

a) Explain following search techniques using appropriate examples:
   i) A*
   ii) Best First Search
   iii) Steepest Ascent Hill Climbing
b) Construct the appropriate semantic net representation for the following sentence:
   "Every dog in the town has bitten the ice cream vendor".
c) What is meant by activation function in ANN? Describe the various activation functions that are employed and compare them.
d) Why knowledge acquisition is a "bottleneck" in implementation of ES? What are knowledge acquisition techniques?

(6+4+4+4)

3.

a) Convert these sentences to propositional logic. Using the logical rules, proof by resolution that "it is good to walk" is a logical consequence of the given information.
   i) It is raining, it is snowing or it is dry.
   ii) It is warm.
   iii) It is not raining.
   iv) It is not snowing.
   v) If the weather is nice, then it is good to walk.
   vi) If the weather is dry and warm, the weather is nice.
b) Explain Back propagation algorithm. What is Back propagation error? Mention the heuristics which will significantly improve the performance of Back Propagation algorithm.

(10+8)

4.

a) How would the minimax procedure have to be modified to be used by a program playing a three person game rather than a two person game?
b) Why natural language processing is required? What are the issues in syntax and semantic analysis phases?
c) Write grammar rules and derive the parse tree for the sentence:
   Bill printed the .init file.

d) How do you decide how many hidden layers and number of neurons in each hidden layer should be there? "Increasing the number of hidden layer neurons gives a better function approximation." Is this statement correct? Defend your answer.

(5+4+4+5)

5.

a) What is bias? Compare weights and bias. What is the use of threshold value?

b) Explain how you can change the weights according to the Hebbian Learning Rule?

c) What are the distinctive characteristics of multilayer perceptron? Enlist any five application areas where ANN will be preferably applicable.

(6+6+6)

6.

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

b) Write a PROLOG program to search a list of elements for a particular item.

c) What is Expert System? How do you distinguish between a KBS and ES? Describe four major problems faced by an ES?

d) Give the practical solutions, where cut and fail may be useful in PROLOG.

(5+5+5+3)

7.

a) What do you understand by underestimation and over estimation of a heuristic function? Why is it must for the heuristic function to underestimate in case of A* algorithm?

b) Explain the key idea of Bayesian statistics for representing knowledge.

c) What is clausal form? How it is related with PROLOG? Why PROLOG is called a declarative language?

(6+6+6)