Sl. No.

BE2-R4 : ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS

NOTE :
1.   **Question 1 is compulsory and attempt 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**

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1.   (a)   What is the unique nature of AI based solutions ? List out the advantages and disadvantages of artificial intelligence.

  (b)   Best First Search can behave as an unguided Depth First Search in the worst case scenario. Justify the statement.

  (c)   How is simulated annealing method better than hill climbing ?

  (d)   Explain how Dempster-Shafer theory deals directly with the distinction between uncertainty and ignorance.

  (e)   How does unification done in PROLOG ? Unify the following pairs :
    (i)   pred1(A, B, [x, y, z]) and pred1(X, prolog, Y)

    (ii)   pred(male, female, mypred(A, A, B)) and pred(L, S, mypred(no, yes, maybe))

  (f)   Explain Hebb's rule and delta rule for learning in ANN.

  (g)   What are the issues and challenges in knowledge acquisition ?   **(7x4)**

2.   (a)   Discuss various task domains of AI with examples.

  (b)   How do you define rationality of an agent ? Explain 4 types of intelligent agents with suitable diagrams.

  (c)   What are the characteristics of informed and uninformed search algorithms ?
                                                                                         (4+10+4)

3.   (a)   Given are the statements "As per the law, it is a crime for an Indian to sell weapons to hostile nations. Country A, an enemy of India, has some missiles, and all the missiles were sold to it by X, who is an Indian citizen."
    (i)   Apply Forward Chaining method to prove that "X is criminal."
    (ii)   Apply Backward Chaining method to prove that "X is criminal."

  (b)   What is the need of probabilistic reasoning ? A doctor is aware that disease meningitis causes a patient to have a stiff neck, and it occurs 80% of the time. The probability of a patient has meningitis disease is 1/30,000 and the probability that a patient has a stiff neck is 2%. Using Baye's theorem find out "what is the probability that a patient has diseases meningitis with a stiff neck ?".   **(9+9)**

4.
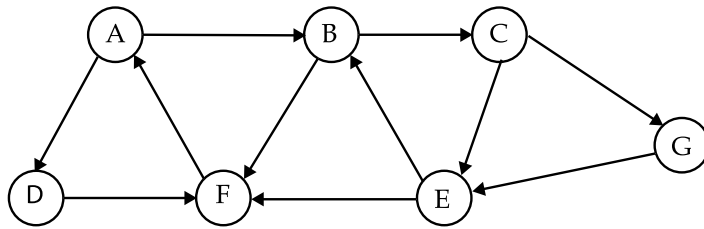
Adjacency Lists
A : B, D
B : C, F
C : E, G
G : E
E : B, F
F : A
D : F

(a) Explain BFS algorithm and apply it on the given graph with it's adjacency list. Discuss the time and space complexity of the algorithm.

(b) Explain A* Search algorithm. Discuss it's performance based on completeness, optimality, time and space complexities.

(c) What are the features of hill climbing method ? Explain different types of hill climbing methods with their advantages and limitations.

(7+6+5)

5. (a) Convert the following sentences to predicate logic :
   (i) No one has climbed every mountain in the Himalayas.
   (ii) There is no business like show business.
   (iii) All Romans were either loyal to Caesar or hated him.
   (iv) People only try to assassinate rulers they aren't loyal to.

(b) Convert the following wff to a clause form.
   A: $(\forall x)\{P(x) \rightarrow [\sim(\forall y)\{Q(x, y) \rightarrow P(f(z))\} \wedge (\forall y)\{Q(x, y) \rightarrow P(x)\}]\}$

(c) If a course is easy, some students are happy. If a course has a final, no students are happy. Use Resolution refutation method to show that "if a course has a final, the course is not easy".

(4+8+6)

6. (a) Explain the role of a parser in NLP tasks. Differentiate between top-down and bottom-up parsing.

(b) Write shortly about Augmented Transition Nets.

(c) PROLOG predicate delete_all/3 is defined as follows :
   1. delete_all(_, [ ], [ ]).
   2. delete_all(Item, [Item|Tail], Result):-
      delete_all(Item, Tail, Result).
   3. delete_all(Item, [Head|Tail], [Head|Result]):-
      delete_all(Item, Tail, Result).
   Provide a trace of the program executing the following call.
   [trace] ?- delete_all(a, [a, b, a], X).

(6+6+6)

7. (a) Differentiate between supervised and unsupervised learning.

   (b) Explain the working of multilayer perceptron neural network with back propagation learning with a suitable diagram. What are the factors that affect the learning in such ANN architecture ?

   (c) What is competitive learning ? How does a Kohonen self-organizing feature map network get trained using competitive learning ? Explain. **(6+6+6)**

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