Reg. No. :

Question Paper Code: U6B03

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Sixth Semester

Biomedical Engineering

21UBM603 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TECHNIQUES

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Write down the applications of Artificial intelligence in the context of   CO1-U
    Healthcare domain.

2. Differentiate local beam search and genetic algorithm.   CO1-U

3. Define rational decision.   CO1-U

4. In a binary classification problem, a Naive Bayes model is trained with a
    dataset containing 800 instances, where 300 belong to class A and 500 belong
    to class B. If a new instance is presented, and the model predicts it as Class A   CO2-App
    with a probability of 0.75, what is the probability of it being predicted as Class
    B?

5. List out the popular machine learning algorithms.   CO1-U

6. Differentiate Classification and regression.   CO1-U

7. Write down the types of ensemble learning.   CO1-U

8. Write the advantages of expectation maximization algorithm.   CO1-U

9. List out the limitations of perceptron.   CO1-U

10 Why is ReLU used in deep learning?   CO1-U

11. (a) Consider the tree shown below. The numbers on the arcs are the arc   CO2-App   (16)
lengths. Assume that the nodes are expanded in alphabetical order when no other order is specified by the search, and that the start state is A and goal is state M. No visited or expanded lists are used. What order would the states be expanded by each type of search? Stop when you expand G. Write only the sequence of states expanded by each search. Write only the sequence of states expanded by the following search
    i) Breadth-first search
    ii) Depth-first search
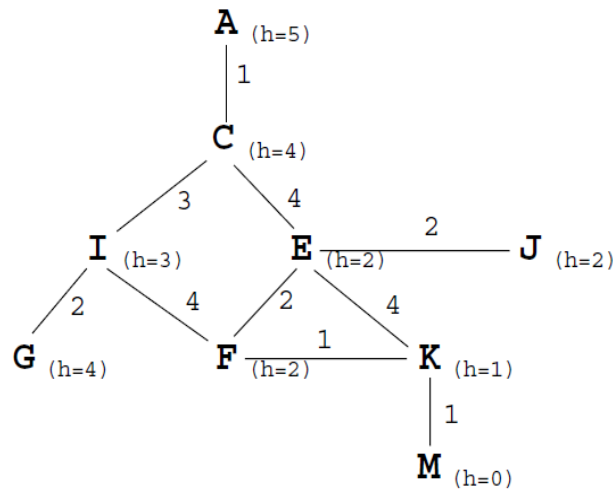
(b) Given an initial state of 8 puzzle problem and find the state to be   CO2-App   (16)
reached.

2	8	3
1	6	4
7		5

Initial state

1	2	3
8		4
7	6	5

Final state

Find the most cost effective path to reach the final state from the initial state using the A* Algorithm.

12. (a) i) Define Baye's rule. How Baye's rule can be applied to tackle   CO1-U   (4)
uncertain Knowledge.

    ii) Consider the following set of propositions: Patient has spots,   CO2-App   (12)
Patient has measles, Patient has high fever, Patient has Rocky mountain spotted fever. Patient has previously been inoculated against measles.
Patient was recently bitten by a tick Patient has an allergy.

a) Create a network that defines the casual connections among these nodes.

b) Make it a Bayesian network by constructing the necessary conditional probability matrix.

(b) i) Briefly explain the joint tree algorithm in Bayesian networks.   CO1-U   (4)

ii) Construct a Bayesian Network and define the necessary CPT's   CO2-App   (12) for the given scenario. We have a bag of three biased coins a, b and c with probabilities of coming up heads of 20%, 60% and 80% respectively. One coin is drawn randomly from the bag (with equal likelihood of drawing each of the three coins) and then the coin is flipped three times to generate the outcomes X1, X2 and X3.

     a) Draw a Bayesian network corresponding to this setup and define the relevant CPTs.

     b) Calculate which coin is most likely to have been drawn if the flips come up HHT.

13. (a) Elaborate in detail about the linear regression Models with   CO1-U   (16) necessary illustrations.

(b) Elaborate in detail about the linear classification Models with   CO1-U   (16) examples.

14. (a) (i) Explain in briefthe K-Nearest Neighbor algorithm with an   CO1-U   (8) example.

(ii) Analyze the computational resources required for training and   CO4-Ana   (8) deploying stacking ensembles in large-scale healthcare systems.

Or

(b) (i) Explain in brief the Expectation maximization algorithm.   CO1-U   (8)

(i) Analyze how bagging and boosting algorithms handle noisy or   CO4-Ana   (8) incomplete data in healthcare data analytics.

15. (a) (i) Explain in brief the shallow net and Deep learning net.   CO1-U   (6)

(ii) Develop a Back propagation algorithm for Multilayer feed   CO1-U   (10) forward neural network consisting of one input layer and one hidden layer and output layer from first principles.

(b) (i) Explain in detail about the various types of activation functions.   CO1-U   (6)

(ii) Explain in detail about the gradient decent optimization   CO1-U   (10) algorithm with example.

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