

AI & ML Algorithm (315330)

MSBTE Diploma · K-Scheme · Model Question Paper — Set C

Time: 3 Hours

Max. Marks: 70

Instructions:

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of Non-programmable Electronic Pocket Calculator is permissible.
7. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:

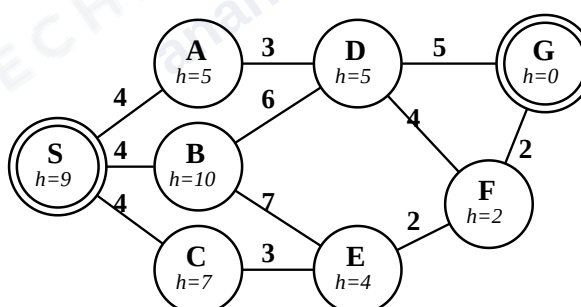
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- a) State any four fields in which Artificial Intelligence is applied.
- b) Define heuristic function. Give one example.
- c) Compare forward chaining and backward chaining (any two points).
- d) List the stages of the machine learning life cycle.
- e) Define overfitting and underfitting.
- f) Define the terms: (i) F1-score (ii) Accuracy.
- g) Define MAE and RMSE.

Q.2 Attempt any THREE of the following:

12

- a) State and explain any two heuristic search techniques. Apply Greedy Best-First search on the following graph from S to G.



- b) Using the Naive Bayes classifier, predict whether a customer with Age = Youth, Income = High, Student = No will buy a computer.

No.	Age	Income	Student	Buys
1	Youth	High	No	No
2	Youth	High	Yes	Yes

3	Youth	Low	Yes	Yes
4	Youth	Low	No	No
5	Senior	High	No	Yes
6	Senior	Low	Yes	Yes
7	Senior	Low	No	No
8	Senior	High	Yes	Yes
9	Youth	Low	No	No
10	Senior	High	No	Yes

- c) Differentiate between statistics and data mining (minimum four points).
- d) Describe the logistic regression learning algorithm with the sigmoid function.

Q.3 Attempt any THREE of the following:

12

- a) Describe the properties of the A* algorithm. Show that A* finds the optimal path S to G for the graph given in Q.2 (a).
- b) Explain the knowledge-based agent with its architecture. Why is it needed in AI?
- c) Differentiate between Artificial Intelligence and Machine Learning (minimum four points).
- d) Write a Python program to implement K-means clustering and display the cluster centres and labels.

Q.4 Attempt any THREE of the following:

12

- a) Explain the types of agents in AI with neat diagrams.
- b) What is uncertainty in AI? State its causes and the need for probabilistic reasoning.
- c) Differentiate between training dataset and testing dataset (minimum four points).
- d) Explain the benefits of cross-validation. Write a Python program to perform k-fold cross-validation.
- e) For the following loan data, calculate the entropy and information gain of Income and Credit. Which attribute should be the root of the decision tree?

Income	Credit	Approved
High	Good	Yes
High	Bad	Yes
Medium	Good	Yes
Medium	Bad	No
Low	Good	Yes
Low	Bad	No

Low	Bad	No
Medium	Good	Yes

Q.5 Attempt any TWO of the following:

12

- Explain the architecture of an artificial neural network with a neat diagram. For a single neuron with inputs $x_1 = 1$, $x_2 = 1$, weights $w_1 = 0.6$, $w_2 = 0.4$ and bias $b = -0.8$, find the output using (i) step function and (ii) sigmoid function.
- Implement multiple linear regression in Python to predict a student's marks from study hours and attendance. Show the regression equation and a prediction.
- Explain the confusion matrix for multiclass classification. For the following confusion matrix (rows = actual, columns = predicted), calculate the accuracy and the precision, recall and F1-score of each class.

Actual \ Predicted	Cat	Dog	Rabbit
Cat	15	3	2
Dog	2	18	0
Rabbit	1	2	17

Q.6 Attempt any TWO of the following:

12

- Explain data cleaning in machine learning. How are missing data and outliers handled? Illustrate with an example.
- Illustrate probabilistic reasoning in AI using a Bayesian network with an example.
- Differentiate between supervised and unsupervised learning (minimum six points). What is semi-supervised learning?

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in