AI & ML Algorithm (315330)

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

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: **10**

a) Define Artificial Intelligence. List any two applications of AI.

b) State any four properties used to measure the performance of a search algorithm.

c) Why are knowledge-based agents used in AI?

d) State any two points of difference between Data Science and Data Analytics.

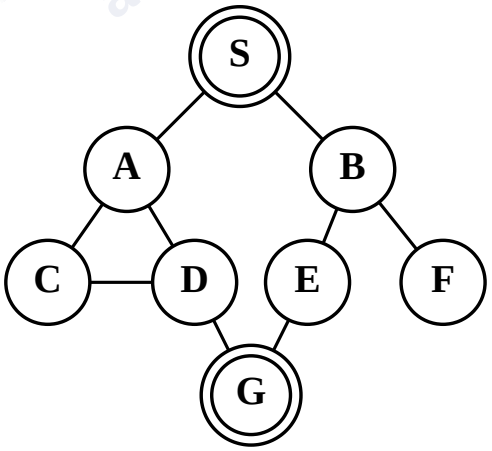
e) List different types of unsupervised machine learning algorithms.

f) State the importance of the confusion matrix.

g) Define linear regression. Give one example.

Q.2 Attempt any THREE of the following: **12**

a) Describe the working of Breadth-First Search (BFS) on the following graph with start node S and goal node G. Show the contents of the queue at each step.



b) Explain data cleaning for missing data and outliers. For the marks 56, 61, —, 58, 63, 60, 59, 98, —, 62 ('—' = missing), fill the missing values with the

median and detect the outlier using the IQR method.

c) Explain cross-validation. What are the positive class and the negative class? State the significance of cross-validation.

d) List and explain different metrics for classification. Calculate them for a disease test with TP = 60, FN = 15, FP = 20, TN = 105.

Q.3 Attempt any THREE of the following: **12**

a) Explain the machine learning life cycle with a neat diagram.

b) Explain the need of probabilistic reasoning in AI. State Bayes' theorem. Machine M1 makes 60% and machine M2 makes 40% of the bolts in a factory; 3% of M1's bolts and 5% of M2's bolts are defective. A bolt picked at random is defective — find the probability that it was made by M2.

c) Explain the hill climbing (local search) algorithm and its problems. The objective values of states 0 to 10 are 3, 5, 8, 6, 4, 7, 10, 12, 9, 5, 2. Apply hill climbing starting from state 1 (neighbours are the states on either side) and comment on the result.

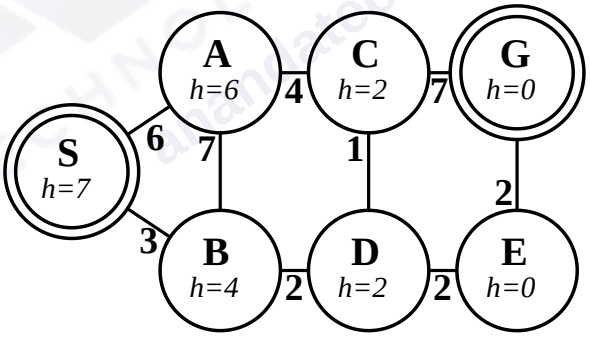
d) Fit a simple linear regression line y = a + bx by the least-squares method for the data below and predict y when x = 7.

Study hours (x)	**1**	**2**	**3**	**4**	**5**	**6**
Marks (y)	35	42	50	55	63	70

Q.4 Attempt any THREE of the following: **12**

a) Explain different designing approaches for knowledge-based agents.

b) Apply the A* algorithm on the following graph to find the optimal path from S to G. Show OPEN and CLOSED lists.



c) Differentiate between overfitting and underfitting (minimum four points).

d) Using k-NN with k = 3 and Euclidean distance, predict the T-shirt size of a customer with height 162 cm and weight 62 kg.

Height (cm)	**Weight (kg)**	**Size**
158	58	M
160	59	M

163	61	M
160	64	L
165	64	L
168	66	L
170	68	L
157	61	M

e) Differentiate between Artificial Intelligence and Machine Learning (minimum four points).

Q.5 Attempt any TWO of the following: **12**

a) Illustrate the Random Forest algorithm with a Python program. State its features.

b) Explain the working of training and testing data in ML with its significance.

c) Explain Mean Absolute Error (MAE), Mean Squared Error (MSE) and Root Mean Squared Error (RMSE). Calculate them for:

Actual price (₹ lakh)	**50**	**62**	**75**	**80**	**95**
Predicted price	48	65	70	84	92

Q.6 Attempt any TWO of the following: **12**

a) Compare supervised and unsupervised machine learning on any six points.

b) Describe the various components of Artificial Intelligence with a neat diagram.

c) List and explain various types of reasoning in AI with an example of each.

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