17707

BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – M.Sc.(ANCS)-2024
Course Name – Artificial Intelligence and Machine Learning
Course Code - MNC30302A
(Semester III)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) When applying Breadth-First Search (BFS) to a tree, what is the first node expanded after the root?

a) Leftmost child b) Rightmost child
c) Deepest node d) Random node

(ii) Which search applies cost + heuristic in route planning?

a) Random walk b) BFS
c) A* search d) DFS

(iii) Which search is more efficient in time but less in space?

a) BFS b) DFS
c) AO* d) Blind search

(iv) What do you mean by entailment?

a) One statement follows from another b) Truth table
c) Formula rewriting d) None

(v) A statement says, "All humans are mortal." Choose the logic system that is best suited to formally represent it.

a) Propositional Logic b) Predicate Logic
c) Both logics are equally suitable d) None of these.

(vi) What do quantiles divide a dataset into?

a) Equal parts b) Random parts
c) Unequal parts d) Two halves only

(vii) What is logistic regression mainly used for in Machine Learning?

a) Predicting continuous values b) Clustering
c) Regression d) Binary Classification

(viii) Which clustering algorithm is partitional?

a) k-Means b) Hierarchical
c) DBSCAN d) Gaussian Mixture

(ix) When you apply Support Vector Machines (SVM) to a classification problem, what does the algorithm aim to do?

a) Generate probability values for each class
b) Cluster data points without labels
c) Find the hyperplane that best separates classes
d) Build a regression line through the dataset

(x) Show why the sigmoid function is commonly used in Machine Learning models.

a) Creates layers
b) Stores weights
c) Maps values to [0,1]
d) Deletes errors

(xi) What does inductive bias indicate for a learning algorithm when making predictions on unseen data?

a) It represents the assumptions that guide the algorithm toward generalization beyond training data
b) It guarantees zero error on the training data
c) It refers to the randomness in selecting features for learning
d) It ensures the algorithm always finds the global optimum

(xii) In a deep neural network, the training is unstable with rapidly fluctuating loss values. By analyzing backpropagation, which issue is most likely occurring?

a) Vanishing gradients, because weights update too slowly in earlier layers
b) Exploding gradients, because weight updates become excessively large
c) Overfitting, because the model memorizes training data
d) Underfitting, because the model fails to capture patterns

(xiii) Which reason best justifies using a multilayer perceptron (MLP) for a complex pattern recognition task?

a) MLPs can model nonlinear relationships between inputs and outputs through hidden layers
b) MLPs require no training and work with raw data directly
c) MLPs always guarantee zero error on unseen data
d) MLPs are faster to implement than linear regression

(xiv) How to measure the effectiveness of Artificial Neural Networks (ANNs) in solving complex problems?

a) They always guarantee 100% accuracy
b) They can model non-linear relationships and learn from data
c) They replace all traditional algorithms completely
d) They eliminate the need for large datasets

(xv) In analyzing search efficiency, which factor distinguishes A* from Greedy Best-First Search?

a) Both use only heuristic
b) A* uses cost + heuristic, Greedy uses heuristic only
c) A* ignores cost
d) Greedy uses cost + heuristic

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Discuss the use of CNF, DNF, Syntax and Semantics in logic systems. (3)
3. Implement the concept of Bayes Rule & Independence to solve a real-world data problem. (3)
4. Critique the trade-off between time and memory efficiency in A* search. (3)
5. Identify key features of Logistic Regression. (3)
6. Explain the concept of Genetic Algorithm Fundamentals to address a real-world problem. (3)

OR

Analyze the effectiveness of Neural Networks in solving machine learning problems. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Evaluate the effectiveness of PEAS Framework in solving real-world problems using AI. (5)
8. Apply the concept of CNF, DNF, Syntax and Semantics to solve a logical reasoning problem. (5)
9. Differentiate between classification and regression. (5)
10. Evaluate the following problem: A medical test for a disease is 95% accurate (i.e., it correctly detects the disease 95% of the time if the person has it). The disease occurs in approximately 1 out of every 1,000 people. If a person tests positive, what is the probability that they have the disease? (5)
11. Illustrate how probability densities are interpreted in real data applications. (5)
12. Critique the advantages and limitations of Neural Networks in artificial intelligence systems. (5)

OR

Summarize the advantages and limitations of genetic algorithm fundamentals in artificial intelligence systems. (5)

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