END TERM EXAMINATION

THIRD SEMESTER (MCA) JANUARY 2024

Paper Code: MCA-203　　　**Subject: Artificial Intelligence and Machine Learning**

Time: 3 Hours　　　　　　　　　　　**Maximum Marks: 75**

Note: Attempt five questions in all including Q. No. 1 which is compulsory. Select one question from each unit.

Q1. Answer the following questions, briefly:　　　　　　　　　(2.5×10=25)

(a) Illustrate problem characterization.

(b) Write three ethics of AI.

(c) Explain travelling salesman problem. How can a real function be maximized or minimized.

(d) Distinguish between monotonic and non-monotonic reasoning.

(e) Compare total sum of squares, sum of squares of residuals, sum of square of regression.

(f) Compose a pseudocode for Means End Analysis (MEA).

(g) Differentiate between supervised and unsupervised machine learning techniques.

(h) Explain confusion matrix. Why do we need confusion matrix?

(i) Identify various activation functions involved in neural networks.

(j) Explain content-based recommender systems.

UNIT - 1

Q2. (a) Given an initial and final state of 8 puzzle problem. Find the most cost-effective path to reach the final state from initial using A* algorithm.　　(6.5)

Start State

3	4	2
7		6
5	1	8

Goal State

1	2	3
8		4
7	6	5

(b) Discuss various problems in hill climbing algorithms and how they can be prevented.　　(6)

OR

Q3. (a) Differentiate between AI, ML and Deep Learning while providing suitable examples.　　(6.5)

(b) Discuss Constraint satisfaction algorithms.　　(6)

UNIT -II

Q4. (a) Check the validity of the following implications via truth table.　　(6.5)

$P \to (Q \to R)$ equivalent to $(P \to Q) \to (P \to R)$

(b) What are forward and backward search planning? Explain with the help of example.　　(6)

OR

Q5. (a) Explain the following term providing an example　　(6.5)
　　(i) Modus Ponen
　　(ii) Modus Tollen

(b) Trace the constraint satisfaction procedure to solve the following cryptarithmetic problem:　　(6)

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    C R O S S
  + R O A D S
  -----------------
    D A N G E R
  -----------------
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UNIT – III

Q6. (a) A market trader sells ball-point pens on his stall. He sells the pen for a different fixed price. x, in each of the six weeks. He notes the number of pens, y That he sells in each of these six weeks. The results are shown in the following table. **(6.5)**

x	10	15	20	25	30	35
y	45	46	37	49	36	48

Calculate the equation of the least squares regression line of y on x.

(b) Elaborate Coefficient of determination, correlation and confusion matrix with equation and proper notation **(6)**

OR

Q7. (a) Elaborate Multiple Linear Regression (MLR) with equations. **(6.5)**

(b) Suppose 10000 patients get tested for flu; out of them, 9000 are actually healthy and 1000 are actually sick. For the sick people, a test was positive for 620 and negative for 380. For the healthy people, the same test was positive for 180 and negative for 8820. Construct a confusion matrix for the data and compute the precision and recall for the data. **(6)**

UNIT - IV

Q8. (a) Differentiate between bagging and boosting algorithms. **(6.5)**

(b) Elaborate the formula for Pearson's correlation coefficient. Can Pearson's correlation coefficient measures correlation between points on a circle? **(6)**

OR

Q9. (a) Discuss the algorithm for a recommender system which uses collaborative filtering. **(6.5)**

(b) Design a neural network model for 5 inputs, 2 hidden layers having 3 and 2 neurons respectively and 1 output. Show various calculations involved to get the output. **(6)**

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