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**Question Paper Code : 30124**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fourth Semester

Computer Science and Engineering

CS 3491 – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(Common to: Computer and Communication Engineering/Information Technology)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define artificial intelligence.
2. What is adversarial search?
3. Define uncertainty.
4. State Bayes' rule.
5. Outline the difference between supervised learning and unsupervised learning.
6. What is a random forest?
7. Define ensemble learning.
8. What is the significance of Gaussian mixture model?
9. Draw the architecture of multilayer perceptron.
10. Name any two activation functions.

PART B — (5 × 13 = 65 marks)

11. (a) Outline the uniformed search strategies like breadth-first search and depth-first search with examples. (13)

Or

- (b) State the constraint satisfaction problem. Outline local search for constraint satisfaction problem with an example. (13)

12. (a) (i) Elaborate on unconditional probability and conditional probability with an example. (6)

- (ii) What is a Bayesian network? Explain the steps followed to construct a Bayesian network with an example. (7)

Or

- (b) What do you mean by inference in Bayesian networks? Outline inference by enumeration with an example. (13)

13. (a) Elaborate on logistics regression with an example. Explain the process of computing coefficients. (13)

Or

- (b) What is a classification tree? Explain the steps to construct a classification tree. List and explain about the different procedures used. (13)

14. (a) (i) What is bagging and boosting? Give example. (3)

- (ii) Outline the steps in the AdaBoost algorithm with an example. (10)

Or

- (b) Elaborate on the steps in expectation-maximization algorithm. (13)

15. (a) Explain the steps in the back propagation learning algorithm. What is the importance of it in designing neural networks? (13)

Or

- (b) Explain a deep feedforward network with a neat sketch. (13)

PART C — (1 × 15 = 15 marks)

16. (a) The values of  $x$  and their corresponding values of  $y$  are shown in the table below.

$x$	1	2	3	4	5	6	7
$y$	3	4	5	5	6	8	10

- (i) Find the least square regression line  $y = ax + b$  (12)

- (ii) Estimate the value of  $y$  when  $x = 10$  (3)

Or

- (b) Consider five points  $\{x_1, x_2, x_3, x_4, x_5\}$  with the following coordinates as a two-dimensional sample for clustering:

$$x_1 = (0.5, 1.75), x_2 = (1, 2), x_3 = (1.75, 0.25), x_4 = (4, 1), x_5 = (6, 3)$$

Illustrate the  $k$ -means algorithm on the above data set. The required number of clusters is two, and initially, clusters are formed from random distribution of samples:  $C_1 = \{x_1, x_2, x_4\}$  and  $C_2 = \{x_3, x_5\}$  (15)