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Printed Page:-3 **Subject Code:- BME0613**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: VI - THEORY EXAMINATION (2025 - 2026)
Subject: Machine Learning in Manufacturing

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

(1.1) Accuracy as a performance measure is defined as (CO1, K1) 1

(a) Correct positives / total positives
(b) Correct predictions / total predictions
(c) Incorrect predictions / total predictions
(d) False positives / total negatives

(1.2) In manufacturing, ML helps improve quality by (CO1, K1) 1

(a) Manual inspection
(b) Automated defect detection
(c) Increasing manpower
(d) Ignoring variations

(1.3) Classification models predict _____. (CO2, K1) 1

(a) Continuous values
(b) Categorical labels
(c) Noise levels
(d) Distances

(1.4) Regression analysis focuses on _____. (CO2, K1) 1

(a) Class boundaries
(b) Continuous outputs
(c) Decision rules
(d) Clusters

(1.5) K-means clustering aims to (CO3, K1) 1

(a) Maximize distance
(b) Minimize within-cluster variance
(c) Maximize entropy
(d) Reduce bias

(1.6) Clustering in manufacturing is used for (CO3, K1) 1

(a) Tool grouping
(b) Process monitoring
(c) Defect analysis
(d) All of these

(1.7) Autonomous manufacturing systems use neural networks for (CO4, K1) 1

(a) Manual control
(b) Decision making
(c) Paper documentation
(d) Only monitoring

(1.8) Hybrid systems combine neural networks with (CO4, K1) 1

(a) Manual control
(b) Optimization algorithms
(c) Paper records
(d) Static rules

(1.9) Model-based learning uses (CO5, K1) 1

(a) Environment model
(b) Trial-and-error only
(c) No planning
(d) Random actions

(1.10) Markov property means (CO5, K1) 1

(a) Future depends on history
(b) Future depends on present state
(c) Random behavior
(d) No dependency

2. Attempt all parts:-

(2.1) Define machine learning in the context of engineering systems. (CO1, K2) 2

(2.2) State the purpose of classification in machine learning. (CO2, K2) 2

(2.3) Explain the concept of unsupervised learning in data analysis. (CO3, K2) 2

(2.4) State the function of fully connected layer in convolutional neural network. (CO4, K2) 2

(2.5) Explain the concept of environment in reinforcement learning. (CO5, K1) 2

SECTION-B 30

Answer any one of the following:-

(3.1) Explain how machine learning improves manufacturing quality control. (CO1, K2) 6

(3.2) Explain the need for machine learning in modern engineering applications. (CO1, 6

K2

Answer any one of the following:-

(3.3) Explain the use of regression techniques in manufacturing applications. (CO2, K3) 6

(3.4) Explain the working principle of the Naïve Bayes classifier. (CO2, K2) 6

Answer any one of the following:-

(3.5) State one benefit of clustering for manufacturing process analysis. (CO3, K3) 6

(3.6) Explain the objective of Principal Component Analysis. (CO3, K3) 6

Answer any one of the following:-

(3.7) State one benefit of evolutionary algorithms in optimization problems. (CO4, K2) 6

(3.8) Explain the role of convolution operation in convolutional neural networks. (CO4, K3) 6

Answer any one of the following:-

(3.9) Describe the learning task formulation in reinforcement learning problems. (CO5, K3) 6

(3.10) Describe the main components involved in a genetic algorithm. (CO5, K3) 6

SECTION-C 50

4. Answer any one of the following:-

(4.1) Explain reinforcement learning architecture and discuss its relevance in automation and control systems. (CO1, K2) 10

(4.2) Explain feature extraction and feature selection methods with examples from manufacturing data. (CO1, K2) 10

5. Answer any one of the following:-

(5.1) Explain the need for model selection procedures in machine learning system development. (CO2, K3) 10

(5.2) Explain the fundamental working mechanism of Support Vector Machines in classification problems. (CO2, K3) 10

6. Answer any one of the following:-

(6.1) Describe the objectives and key characteristics of cluster analysis in machine learning. (CO3, K2) 10

(6.2) Explain how Principal Component Analysis transforms original variables into principal components. (CO3, K3) 10

7. Answer any one of the following:-

(7.1) Explain the working principle of downhill simplex search method. (CO4, K2) 10

(7.2) Describe the role of convolution operation in convolutional neural network architectures. (CO4, K3) 10

8. Answer any one of the following:-

(8.1) Explain the model of evolution and learning in the context of Genetic Algorithms. (CO5 , K3) 10

(8.2) Explain the structure and components of a Markov Decision Process. (CO5, K2) 10