No. of Printed Pages : 5

RCSE–002

Ph. D. IN COMPUTER SCIENCE (PHDCS)

Term-End Examination

December, 2025

RCSE–002 : MACHINE LEARNING

Time : 3 Hours *Maximum Marks : 100*

***Note** : (i) Question No. **1** is compulsory.*

*(ii) Answer any **three** questions from the rest*

1. (a) Why machine learning is getting popular ? What is role of data in developing machine learning models ? Explain the difference between supervised learning and unsupervised learning. 10

   (b) Write and explain Central Limit theorem. Also explain application of this theorem in machine learning. 10

(c) Write FIND-S algorithm for finding a maximally specific hypothesis. Also discuss its advantages and disadvantages. 8

(d) Explain Bayesian classification with the help of a suitable example. Also, discuss the limitation of it. 12

2. (a) What is hypothesis ? What are its types ? Explain the meaning of hypothesis testing. Also explain with example, when a hypothesis should be rejected. 10

(b) What is PAC learning model ? Explain its use in machine learning. 10

3. (a) What is Vapnic-Chervonenkis (VC) dimension ? Explain how VC dimension help in analyzing complex problems ? 10

(b) What is agnostic learning ? Explain the characteristics of agnostic learning. Also, explain any *two* real-life agnostic learning problems. 10

4. (a) What is Artificial Neural Network (ANN) ? Design an ANN model using perception to implement OR logic function. 6

(b) What is decision tree ? Use ID3 algorithm to create a decision tree for the following data sample. 14

Name	Give birth	Can fly	Live in water	Have legs	Class
Human	yes	no	no	yes	mammals
Python	no	no	no	no	non-mammals
Salmon	no	no	yes	no	non-mammals
Whale	yes	no	yes	no	mammals
Frog	no	no	sometimes	yes	non-mammals
Komodo	no	no	no	yes	non-mammals
bat	yes	yes	no	yes	mammals
Pigeon	no	yes	no	yes	non-mammals
Cat	yes	no	no	yes	mammals

Leopard shark	yes	no	yes	no	non-mammals
Turtle	no	no	sometimes	yes	non-mammals
Penguin	no	no	sometimes	yes	non-mammals
Porcupine	yes	no	no	yes	mammals
Eel	no	no	yes	no	non-mammals
Sala-mander	no	no	sometimes	yes	non-mammals
Gila monster	no	no	no	yes	non-mammals
Platypus	no	no	no	yes	mammals
Owl	no	yes	no	yes	non-mammals
Dolphin	yes	no	yes	no	mammals
Eagle	no	yes	no	yes	non-mammals

5. (a) What is confusion matrix ? Explain the following evaluation parameters with the help of a suitable example for each : 10

(i) Accuracy

(ii) Precision

(iii) Recall

(iv) Specificity

(v) F-1 score

(b) What is expectation maximization algorithm ? Explain it with the help of a suitable example. 10

× × × × ×