Roll No.												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION – JAN 2023

Course Code: ECE 299

Course Name: Computational Intelligence and Machine Learning

Programme: B.Tech

Date: 25-JAN-2023

Time: 09.30am to 12.30am

Max Marks: 80

Weightage: 40%

Part A[Memory Recall Questions]

Answer all Questions. Each question carries 2 mark. (15QX2M=30M)

1) Probabilistic reasoning is a way of knowledge representation where we apply the concept of probability to indicate the uncertainty in knowledge. The probabilistic reasoning depends upon_____. Knowledge (C.O.No.1) [Knowledge]

A) Estimation B) Observations

C) Likelihood D) All of the above

2) An “algorithm” in machine learning is a procedure that is run on data to create a machine learning “model.” An Algorithm is said as Complete algorithm if_____ (C.O.No.1) [Knowledge]

A) It ends with a solution (if any exists). B) It begins with a solution.

C) It does not end with a solution. D) It contains a loop

3) Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine Learning is a field of AI consisting of learning algorithms that..... (C.O.No.1) [Knowledge]

A) At executing some task B) Over time with experience

C) Improve their performance D) All of the above

4) Machine learning algorithms use historical data as input to predict new output values. Who is the father of Machine Learning? (C.O.No.1) [Knowledge]

A) Geoffrey Hill B) Geoffrey Chaucer

C) Geoffrey Everest Hinton D) None of the above

5) Machine learning algorithms have the ability to improve themselves through training. One of the Application of Machine learning is _____. (C.O.No.1) [Knowledge]

A) Email filtering B) Sentimental analysis

C) Face recognition D) All of the above

6) Reduction of dimensionality is the method of reducing with consideration the dimensionality of the function space by obtaining a collection of principal features. The selection of features tries to pick a subset of the original features to be used in the machine learning model. It is not necessary to have a target variable for applying dimensionality reduction algorithms. (C.O.No.1) [Knowledge]

A) True. B) False

C) Maybe. D) Cannot be determined.

7) The genetic algorithm is a method for solving both constrained and unconstrained optimization problems that is based on natural selection, the process that drives biological evolution. When would the genetic algorithm terminate? (C.O.No.1) [Knowledge]

A) Maximum number of generations has been produced

B) Satisfactory fitness level has been reached for the population

C) Both A & B D) None of these

8) Everything in life depends on time and therefore, represents a sequence. To perform machine learning we can use sequential data. Sequential learning is based on considered data points in _____ for training. (C.O.No.1) [Knowledge]

A) One a time for training B) All in a batch form for training

C) Set of data for training D) None of the above

9) Support Vector Machine (SVM) is a supervised machine learning algorithm used for both classification and regression. The objective of SVM algorithm is to find a hyper plane in an N-dimensional space that distinctly classifies the data points. What do you mean by a hard margin? (C.O.No.1) [Knowledge]

A) The svm allows high amount of error in classification

B) The svm allows very low error in classification

C) Both 1 & 2 D) None of the above

10) In machine learning, multiclass or multinomial classification is the problem of classifying instances into one of three or more classes (classifying instances into one of two classes is called binary classification).Which of the following method is used for multiclass classification? (C.O.No.1)[Knowledge]

A) One vs Rest B) One

C) All vs One D) One vs Another

11) Curve fitting is the major task in regression concept. _____ is the scenario when the model fails to decipher or misses data point to fit on a curve and to find the underlying trend in the input data.
(C.O.No.1) [Knowledge]

A) Over fitting B) Under fitting

C) Both A and B D) None of the above

12) Machine learning is a method of data analysis that automates analytical model building. The goal of unsupervised learning problem may be to discover groups of similar examples within the data. This is called as _____? (C.O.No.1) [Knowledge]

A) Clustering B) Exploration

C) Reinforcement learning D) Supervised Learning

13) Gaussian distribution is a bell-shaped curve, and it is assumed that during any measurement values. Gaussian distribution is also known as---------- (C.O.No.1) [Knowledge]

A) Normal distribution B) Maximum likelihood

C) Sum-of-squares D) Regularization

14) Everything in life depends on time and therefore, represents a sequence. To perform machine learning we can use sequential data. Sequential learning is based on considered data points in _____ for training.
(C.O.No.1) [Knowledge]

A) One a time for training B) All in a batch form for training

C) Set of data for training D) None of the above

15) Regression is a predictive modeling technique investigating relationship between dependent and independent variables. In linear model of regression, the term Ø(x) W.R.T input variable X is
(C.O.No.1)[Knowledge]

A) Sum function B) Product function

C) Basis function D) Basic function

Part B [Thought Provoking Questions]

Answer all Questions. Each question carries 10 marks. (2Qx10M=20M)

16) Bacterial Foraging Optimization (BFO) is a recently developed nature-inspired optimization algorithm, which is based on the foraging behavior of E. coli bacteria. Up to now, BFO has been applied successfully to some engineering problems due to its simplicity and ease of implementation. However, BFO possesses a poor convergence behavior over complex optimization problems as compared to other nature-inspired optimization techniques.

A) Identify the process of optimization for finding the best and feasible solution to a cost function with respect to Bacterial Foraging (5M)

B) How Support Vector Machine will become more popular in classification of 2D Data. (5M)

17) In computational science, particle swarm optimization (PSO) is a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality. The algorithm was simplified and it was observed to be performing optimization.

Consider a scenario that, five particles (Say A, B, C, D and E) are moving around the solution space (Say P). Each particle moves around the solution space randomly but at the same time attracted by other poles, its past best position (solution) and the best position (solution) of the whole swarm (collection of particles). These poles modify the velocity vector of the particles at each iteration.

How these swarms modify their velocity vectors in the form of their position. Form an algorithm with suitable equations. (C.O.No.3) [Comprehension]

Part C [Problem Solving Questions]

Answer **all** Questions. **Each** question carries **10** marks. (3Qx10M=30M)

18) Logistic Regression is one of the most popular linear classification models that perform well for binary classification but falls short in the case of multiple classification problems with well-separated classes. While Linear Discriminant Analysis (LDA) handles these quite efficiently. LDA can also be used in data preprocessing to reduce the number of features just as Principle component analysis which reduces the computing cost significantly. (C.O.No.2) [Application]

Consider two data sets as mentioned below, what will be suitable weight vector which will be used to perform classification as well as dimensionality reduction.

X1= {(4,1), (2,4), (2,3),(3,6),(4,4)}

X2= {(9,10),(6,8),(9,5),(8,7),(10,8)}

19) K-means algorithm is an iterative algorithm that tries to partition the dataset into K-pre-defined distinct non-overlapping subgroups (clusters) where each data point belongs to only one group. It tries to make the intra-cluster data points as similar as possible while also keeping the clusters as different as possible. It assigns data points to a cluster such that the sum of the squared distance between the data points and the cluster's centroid is at the minimum. (C.O.No.3) [Comprehension]

Consider data sets X and Y as given below. Show the steps of calculation for data points until final clustering is done where no data points are changing clusters.

X	1	2	2	3	4	5
Y	1	1	3	2	3	5

20) Ant colony optimization (ACO) is an optimization algorithm which employs the probabilistic technique and is used for solving computational problems and finding the optimal path with the help of graphs. An ACO is a population-based Algorithm that can be used to find approximate solutions to difficult optimization problems. In ACO, a set of software agents called artificial ants search for good solutions to a given optimization problem.

Consider the problem of finding the optimum order in which the numbers from 1 to 9 are arranged so that the cost of order is maximum. Assume that six ants have the cost functions (C1, C2, C3, C4, C5, and C6). Consider the following are the orders selected by the six ants along with the corresponding Cost as given below.

ANT Number	ORDER									COST
ANT1	4	6	7	8	1	2	5	9	3	C1
ANT2	5	6	7	3	4	1	9	2	8	C2
ANT3	8	4	9	6	3	1	2	7	5	C3
ANT4	5	6	8	2	3	9	7	1	4	C4
ANT5	5	8	9	2	7	3	6	4	1	C5
ANT6	3	2	4	1	7	5	8	6	9	C6

A) Identify the name of matrix which will be used in ACO and Design the Same matrix from above said data. (5M)

B) Mention the optimization steps (as a flowchart) in ACO. (5M)