KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 060

ODD SEMESTER 2024- 2025

CONTINUOUS ASSESSMENT TEST – I

(Regulations 2020)

Month and Year	:July& 2024	Roll Number	:
Programme Branch Semester	: B.E. :Mechatronics Engineering : VII	Date Time	: 29.07.2024 : 02.30pm to 04.00pm
Course Code Course Name	: 20MTH01 : Deep Learning	Duration Maximum Marks	: 1 ½ Hours : 50

PART – A (10 X 2 = 20 Marks)

ANSWER ALL QUESTIONS

1. Interpret that the set $V = \{(x, y) \in R^2 \mid xy \geq 0\}$ is not a vector space of R^2. [CO1,K2]
2. Find the eigenvalues of the matrix, [CO1,K2]

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 4 & -17 & 8 \end{bmatrix}$$

3. Given a linear transformation T on $V_3(\mathbf{R})$ defined by T(a, b, c) = (2b + c, a – 4b, 3a) corresponding to the basis B = {(1, 0, 0), (0, 1, 0), (0, 0, 1)}. Estimate the matrix representation of T. [CO1,K2]
4. Differentiate machine learning and statistics. [CO1,K2]
5. Relate the concept of variance in influencing the overfitting in the data modeling. [CO1,K2]
6. Outline the association of machine learning with other major fields of data science. [CO1,K2]
7. Illustrate the concept of reinforcement learning. [CO2,K2]
8. Represent the survey table of machine learning implementation in modern applications. [CO2,K2]
9. Discussthe structure of deep learning network layers applied in object detection. [CO2,K2]
10. Recall the various activation functions with the equations involved in deep learning networks. [CO2,K2]

PART – B (3 X 10 = 30 Marks)

ANSWER ANY THREE QUESTIONS

11. Analyze that the following matrix is diagonalizable to execute the pattern recognition task: [CO1,K3]

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$$

12. (i) Solve whether the following vector is linearly dependent or linearly independent: (1, 2, –3, 1), (3, 7, 1, –2), (1, 3, 7, –4). (5 Marks) [CO1,K3]

    (ii) Verify whether the polynomials $x^3 - 5x^2 - 2x + 3$, $x^3 - 1$, $x^3 + 2x + 4$ are linearly independent. (5 Marks)
13. Describe in detail the Machine Learning process involved in cross-industry standard process-data mining methodology with a neat diagram. [CO1,K2]
14. Demonstrate the detailed procedure involved in support vector machine and stochastic gradient descent algorithms in data analysis. [CO2,K2]

2 marks : 5 applications of RNN, CNN structures for x-Ray images

(16 Marks) Unit-5 : neural network architectures for robotic control

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage		67%	33%	-	-	-

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PART – A (10 X 2 = 20 Marks)

ANSWER ALL QUESTIONS

1. Show that the matrix A is unitary matrix $A = \frac{1}{5}\begin{bmatrix} -1+2i & -4-2i \\ 2-4i & -2-i \end{bmatrix}$ [CO1,K2]

2. Find the eigenvalues of $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 4 & -17 & 8 \end{bmatrix}$ [CO1,K2]

3. Given a linear transformation T on $V_3(\mathbf{R})$ defined by T(a, b, c) = (2b + c, a – 4b, 3a) corresponding to the basis B = {(1, 0, 0), (0, 1, 0), (0, 0, 1)}. Estimate the matrix representation of T. [CO1,K2]

4. Differentiate the supervised and unsupervised machine learning. [CO1,K2]

5. Relate the concept of bias in estimating the underfitting of the data models. [CO1,K2]

6. Show that the transformation T: $V_2(\mathbf{R}) \rightarrow V_2(\mathbf{R})$ defined by T(a, b) = (a + b, a) ∀ a, b ∈**R** is a linear transformation. [CO1,K2]

7. Illustrate the concept of a multi-layer perceptron network. [CO2,K2]

8. Represent the challenges of machine learning implementation in modern applications. [CO2,K2]

9. Outlinethe steps involved in gathering experience in the learning system related to model deployment. [CO2,K2]

10. Determine whether the following vector is linearly dependent or linearly independent: (1, 2, –3, 1), (3, 7, 1, –2), (1, 3, 7, –4). [CO2,K2]

PART – B (3 X 10 = 30 Marks)

ANSWER ANY THREE QUESTIONS

11. Analyze that the following matrix is diagonalizable to execute the pattern recognition task: [CO1,K3]

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$$

12. (i) Solve the following system of linear equations: (5 Marks) [CO1,K3]

x + y + z = 6

x + 2y + 3z = 14

x + 4y + 7z = 30

(ii) Verify the rank and the nullity of the following matrix deployed in pattern recognition:

$$\begin{bmatrix} 1 & -2 & -1 & 4 \\ 2 & -4 & 3 & 5 \\ -1 & 2 & 6 & -7 \end{bmatrix}$$

(5 Marks)

13. Explain the data mining procedure involved in the CSIP platform of the machine learning process applied to the big data. [CO1,K2]

14. Demonstrate the detailed procedure involved in the formation of the first derivative of sigmoid and tangent hyperbolic functions. [CO2,K2]

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage		67%	33%	-	-	-

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 060
ODD SEMESTER 2024- 2025
CONTINUOUS ASSESSMENT TEST – II
(Regulations 2020)

Month and Year	:Sep 2024	Roll Number	:
Programme Branch Semester	: B.E. : Mechatronics Engineering : VII	Date Time	: 04.09.2024 : 02.30pm to 04.00pm
Course Code Course Name	: 20MTH01 : Deep Learning	Duration Maximum Marks	: 1 ½ Hours : 50

PART – A (10 X 2 = 20 Marks)
ANSWER ALL QUESTIONS

1. Consider the mark list V={88,92,48}. Apply the min-max procedure and map marks in the range of 0-1. [CO2,K3]
2. Determine the correlation of data X={1,2,3,4,5} and Y={1,4,9,16,25}. [CO2,K3]
3. Classification analysis is an example of supervised learning. Justify your answer. [CO2,K2]
4. Distinguish between model based and instance learning methods. [CO2,K2]
5. Relate the functioning of optimal hyperplane in Support Vector Machine learning algorithm. [CO2,K2]
6. Show the equations for functional and geometric margin in Support Vector Machine implementation. [CO2,K2]
7. Illustrate the concept of Stochastic Gradient Descent technique in data processing. [CO3,K2]
8. Show the stem and leaf plot for the data{13,11,40,53,44,78,99}. [CO3,K2]
9. Discuss the structure of autoencoder applied in data mining. [CO3,K2]
10. Recall the various loss functions with the equations involved in deep learning optimization networks. [CO3,K2]

PART – B (3 X 10 = 30 Marks)
ANSWER ANY THREE QUESTIONS

11. The hyperplane function of two variables is $b+a_1x_1+ a_2x_1$. If the two hyperplanes given for classifier 1 as $7+8x_1+3x_2$ and $4+5x_1+9x_2$ for classifier 2. Find the distance error function and pick a good classifier constructed using these classifiers. [CO2,K3]

12. (i) Construct OR function using perceptron. (5 Marks) [CO1,K3]
(ii) Construct AND function using McCulloch-pitts network. (5 Marks)

13. Describe in detail the Stochastic gradient descent and mini-batch gradient descent with mathematical representation of boundary conditions. [CO2,K2]

14. Summarize the functionalities of the following: [CO3,K2]
a). Vanilla Auto encoder b). Denoising auto encoder

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analyzing (K4)	Evaluating (K5)	Creating (K6)
Percentage	-	60%	40%	-	-	-

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ODD SEMESTER 2024- 2025

CONTINUOUS ASSESSMENT TEST – II

(Regulations 2020)

Month and Year	:Sep 2024	Roll Number	:
Programme Branch Semester	: B.E. : Mechatronics Engineering : VII	Date Time	: 04.09.2024 : 02.30pm to 04.00pm
Course Code Course Name	: 20MTH01 : Deep Learning	Duration Maximum Marks	: 1 ½ Hours : 50

PART – A (10 X 2 = 20 Marks)

ANSWER ALL QUESTIONS

1. • Compute the Inter Quartile range if the patients age list are { 13,15,16,17,18,19,22,23}. [CO2,K3]
2. Determine the 5-point summary of the list {13,11,2,3,4,8,9}. [CO2,K3]
3. Illustrate how hinge loss function is used in SVM model for binary classification [CO2,K2]
4. How does the weight function of locally weighted liner regression is calculated? [CO2,K2]
5. Show the methods used to validate linear regression model. [CO2,K2]
6. Consider the sample data shown below. For the test instance X=6 and Y=5, compute the class based on nearest centroid classifier algorithm. [CO2,K2]

X	Y	CLASS
3	1	A
5	2	A
6	7	B
8	5	B

7. Calculate the total number of parameters with bias on the given neural network: Input layer -5 nodes, hidden layer I-6 nodes, hidden layer II -3 nodes, ouput layer -2 nodes. [CO3,K2]
8. How do you differentiate an Autoencoder and Deep Neural Network architecture. [CO3,K2]
9. Why do you prefer mini batch gradient descent technique than stochastic gradient descent? [CO3,K2]
10. Comapre Hopfield network and Boltzmann machines. [CO3,K2]

PART – B (3 X 10 = 30 Marks)

ANSWER ANY THREE QUESTIONS

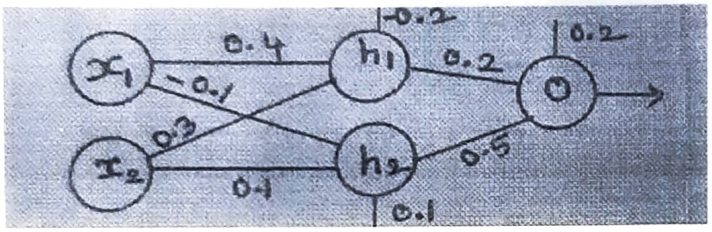
11. In a feed forward neural network, with the following specifications: i/p layer has 4 neurions, hidden layer has 3 neurons & o/p layer has 2 neurons using sigmoid function for given input values [0.5, 0.8, 0.2, 0.6] as well as the initial weights for the connections. W1:[0.1,0.3,0.5,0.2], W2:[0.2,0.4,0.6,0.2] i/p layer to hidden layer weights, W3:[0.3,0.5,0.7,0.2], W4:[0.4,0.10.3], W5: [0.5,0.2,0.4] Hidden layer to o/p layer weights. calculate the output of the neural network. [CO2,K3]

12. Consider the 5 months of rainfall data instances shown in table. [CO1,K3]

S.No	Month (Xi)	Rainfall (Yi) in mm
1	1	85
2	2	80
3	3	81
4	4	45
5	5	50

Predict the rainfall during 7th and 8th month using weighted linear regression algorithm.

13. Consider the following multilayer feed forward network. [CO2,K3]



Here (x1, x2)=(1,0) and O=(0.3) and learning rate is 0.1.Uisng the backpropogation algorithm, show how the weights and bias are updated after one epoch.

14. How do you achieve regularization in autoencoder? Explain [CO3,K2]

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analyzing (K4)	Evaluating (K5)	Creating (K6)
Percentage	-	37%	63%	-	-	-