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Question Paper Code: U8103

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Professional Elective

Computer Science and Engineering

21ITV103– NEURAL NETWORKS AND DEEP LEARNING

(Common to IT Engineering Branches)

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Explain the terms: axon, cell body, synapse and dendrite   CO1-U

2. Draw a neural network for predicting whether a person will buy a product   CO2-App
    based on Age and Estimated Salary.

3. What is Delta Rule for pattern association?   CO1-U

4. What are the different types of competitive networks   CO1-U

5. Consider the use of the following Convolutional Neural Networks (CNN) for   CO2-App
    image understanding applications. For a Given the input binary solve the
    following problems :

5	1	2	9	-6
3	4	-7	3	11
2	-9	6	13	5
14	7	2	-8	3
-5	3	1	6	8

    Using a 2X2 filter as a convolution kernel. What is the output?

1	0
0	1

6. 48 filters of size 21 x 21 is applied to an image of size 327 x 327, with zero   CO2-App
    padding and stride of 3. The image is an RGB image. The depth of the filter is
    same as the depth of image. What will be the volume of the final image?

7. Which techniques helps in speeding up the training process and making deep networks more stable? CO1-U

8. How does dropout help in regularizing neural networks? CO2-App

9. Which deep learning technique is commonly used for text classification in NLP? Justify your answer CO1-U

10. List down three differences between LSTM and RNN. CO1-U

<center>PART – B (5 x 16= 80 Marks)</center>

11. (a) To Classify emails as spam (1) or not spam (0) based on: CO2 – App (16)
    1. Number of exclamation marks in subject
    2. Number of spam trigger words (e.g., "free", "win", "offer")
    3. Sender reputation score (0-1) using any one neural network
    and draw the network

<center>Or</center>

    (b) A multi-layer perceptron network as shown in figure consists of two neurons in the input layer, two neurons in the hidden layer and one neuron in the output layer. A training pattern with input [0.4, -7] and target output [0.1] is presented to the MLP network. Calculate the modified weights [V] between input and hidden layers and weights [W] between hidden and output layers. Assume the initial weights. CO2 – App (16)

$$[V]^0 = \begin{bmatrix} 0.1 & 0.4 \\ -0.2 & 0.2 \end{bmatrix} \quad : \quad [W]^0 = \begin{bmatrix} 0.2 \\ -0.5 \end{bmatrix}$$
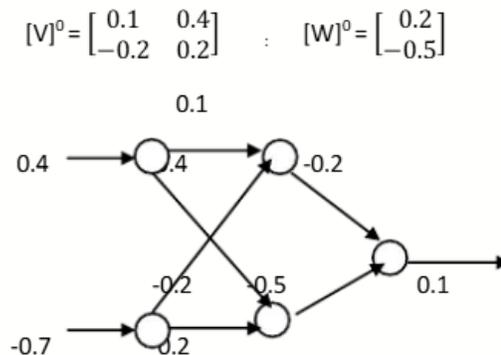
12. (a) Draw the architecture of hetero associative network to implement the following problem. Find the weight matrix with the training input and target vector pairs. S1 = (1,1,0,0): t1 = (1,0), S2 = (0,1,0,0): t2 = (1,0), S3 = (0,0,1,1): t3 = (0,1), S4 = (0,0,1,0): t4 = (0,1). CO2- App (16)

<center>Or</center>

    (b) Given the exemplar vector e(1)=(-1 1 1 -1) and e(2)=(1 -1 1 -1). Use Hamming net to find the exemplar vector close to bipolar input patterns (1 1 -1 -1), (1 -1 -1 -1), (-1 -1 -1 1) and (-1 -1 1 1). CO2- App (16)

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13. (a) Let us consider a Convolutional Neural Network having two CO2 – App (16)
different Convolutional Layers in the Architecture in which first
layer is having 32 filters of 5 * 5 with stride-1 and pad-0
followed by a Maxpool of 6 filters with 2 X 2 size , Stride-1,
Padding-0. Wherein Layer-2 is having 16 filters of Size: 5 X 5,
Stride-1, Pad-0, followed by a Max-Pooling: (Filter Size: 2 X 2
with Stride-2). If a 3-D image of dimension 32 X 32 is given as
the input to the network:
a. Define the model using python programming .
b. Determine the dimension of the vector after passing through a
flattening layer in the architecture.
c. Draw the CNN architecture.

Or

(b) Draw and explain the architecture of a convolutional neural CO2 – App (16)
network model to classify 'O' and 'X' images.(eg: 'O')

14. (a) You are a robot in a lumber yard, and must learn to discriminate CO2- App (16)
Oak wood from Pine wood. Apply Navie Bayes algorithm to
classify the sample data. You are given the following (noisy)
examples:

Example	Density	Grain	Hardness	Class
Example #1	Light	Small	Hard	Oak
Example #2	Heavy	Large	Hard	Oak
Example #3	Heavy	Small	Soft	Oak
Example #4	Heavy	Small	Soft	Oak
Example #5	Light	Large	Hard	Pine
Example #6	Light	Small	Soft	Pine
Example #7	Heavy	Large	Soft	Pine
Example #8	Light	Large	Hard	Pine

Consider a new example :
(Density=Heavy $\wedge$ Grain=Small $\wedge$ Hardness=Hard). Write these
class probabilities as the product of α and common fractions
from above.

Or

(b) Design any one deep learning model with batch normalization CO2- App (16)
for image classification

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15. (a) Consider the following sentence "I like ……………" and predict   CO2 – App   (16)
the next word (eg: Learning) using Bidirectional recurrent neural
network.

Or

(b) Assume that some people are asked to rate a set of movies on a   CO2 – App   (16)
scale of 1–5 and each movie could be explained in terms of a set
of latent factors such as drama, fantasy, action and many more.
Use any one recurrent neural networks

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