

B.E. Computer Science & Engineering (Model Curriculum) Semester - VI  
**TEE2043CS - Elective Paper-III : Neural Network and Deep Learning**

P. Pages : 2

Time : Three Hours



GUG/S/23/13829

Max. Marks : 80

- Notes :
1. All questions are compulsory.
  2. All questions carry equal marks.
  3. Assume suitable data wherever necessary.
  4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) What are the different Learning Methods used in ANNs? Explain each method briefly. 8  
b) What is an Artificial Neuron? Explain how the organization of biological neural network in brain inspires the multi-layer architecture of ANN. 8

**OR**

2. a) Draw and explain the mathematical model of a McCulloch-Pitts Neuron, and give the expressions for the output(y) considering the 3 input neuron. 8  
b) Explain how artificial Intelligence, machine Learning and deep learning are related. List the limitation of traditional machine learning system. How those limitations can be overcome by Deep learning? 8
3. a) State true or false – “*Single Perceptron solve only linearly separable problem*”. Justify your answer by giving **equation of separator** and **inequalities** for the following 2 input logical function 1) OR 2) XOR. Among this two logical function which one is **linearly non separable? And why?** 8  
b) Differentiate between: 8  
a) Non-linear and Linear activation function.  
b) Tanh and Sigmoid function.

**OR**

4. a) What is an activation function and why to use them? Why do we need non-linear activation functions? List and explain any 3 activation functions. 8  
b) Write a steps for Perceptron Learning Algorithm. List limitations of single layer Perceptron. Explain how multi-layer perceptron addresses the challenge. 8
5. a) What do you mean by Gradient Descent? Explain how to learn Multilayer Networks using Gradient Descent Algorithm. 8  
b) Give the typical machine learning setup and illustrate it with movie like/dislike example with respect to following components: 8  
***Data, Model, Parameters, Learning Algorithm, Loss/Error function.***

**OR**

6. a) What is Associative Memory in Artificial Neural Networks (ANNs)? Explain with an example. 8  
b) What are the applications of ART in ANNs? Provide examples. 8
7. a) What is under fitting and overfitting of a model? Give the reasons and ways to tackle it. How Bias and Variance plays the role for Under and Overfitting of a Model? Give the approach to find the Best fit Model. 10  
b) What is dropout regularization? How does it help in preventing overfitting? 6

**OR**

8. a) What is regularization in deep learning? How does it help in preventing overfitting? What is L1 & L2 regularization? How does it work? 8
- b) What is the vanishing gradient problem? How does it affect deep neural networks? What are the strategies to mitigate the vanishing gradient problem? 8
9. a) Explain the role of filter, padding and strides in a convolution layer of a CNN. What will be the shape of the output matrix for an image of size 15 X 15 if padding size is 1, stride size is 2 and 3 X 3 filter used for convolution. 8
- b) Given the input matrix and the kernel, perform convolution with stride being 2, & padding being 1. 8

1	0	1	1	0
0	0	0	1	1
1	0	0	0	1
0	1	1	1	0
1	1	0	1	0

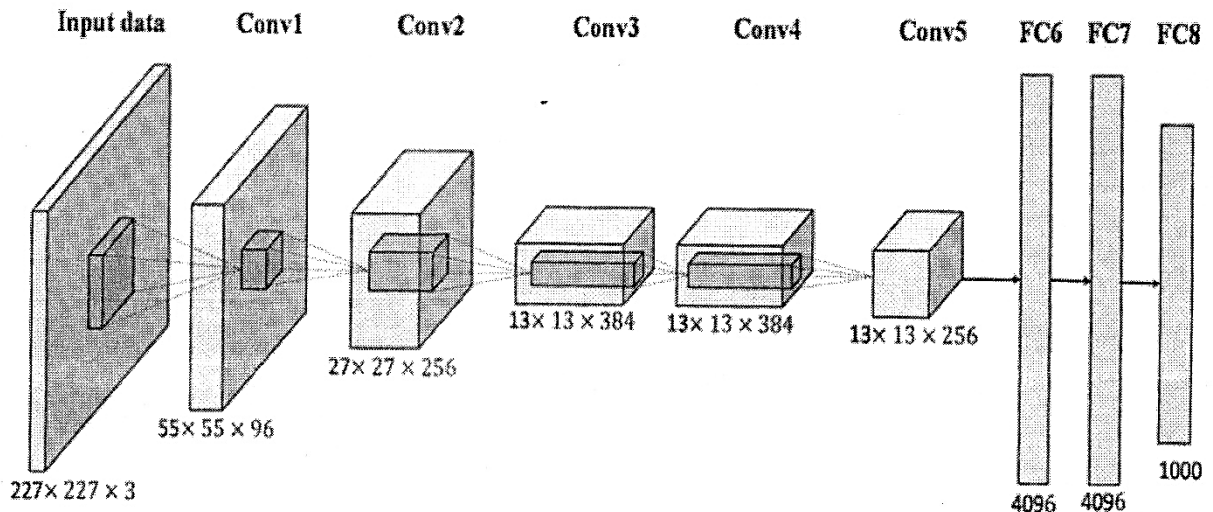
Input matrix

1	0	0
0	0	1
1	1	0

Kernel

OR

10. a) Consider the following convolutional neural network wherein five convolutional layers and three fully connected layers are employed: 12



Compute the number of parameters in each and every layer. Also list the number of filters applied in each convolutional layer assuming the padding in all the convolutional layers is valid. The strides in these convolutional operations are four for Conv1, two for Conv2 and Conv3, and one for Conv4 and Conv5.

- b) List and explain the following in the context of convolutional neural networks: 4
- Padding
  - Strided convolution

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