

2123
B.E. (Computer Science and Engineering)
Seventh Semester
Elective - III
CS -705B: Neural Network

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.

x-x-x

Section-A										
1.	a) What is a neural network, and how does it function? b) What is the vanishing gradient problem, and how does it affect the training of deep neural networks? c) What is transfer learning in the context of neural networks, and why is it beneficial? d) What is the role of radial basis functions in Radial Basis Networks, and how do they contribute to the network's operation e) What is a Self-Organizing Map (SOM), and what are its primary applications in machine learning and data analysis?	10								
Section-B										
2.	a) What is difference between supervised, unsupervised, and reinforcement learning in the context of neural networks? b) Suppose you have the following data with one real-value input variable & one real-value output variable. What is leave-one out cross validation mean square error in case of linear regression ($Y = bX+c$)? <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>X (independent variable)</th> <th>Y (dependent variable)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>2</td> </tr> <tr> <td>2</td> <td>2</td> </tr> <tr> <td>3</td> <td>1</td> </tr> </tbody> </table>	X (independent variable)	Y (dependent variable)	0	2	2	2	3	1	5 5
X (independent variable)	Y (dependent variable)									
0	2									
2	2									
3	1									
3.	a) How does the winner-takes-all mechanism work in competitive learning, and what is its significance in the learning process? b) What are the main challenges associated with choosing an appropriate learning rate in gradient descent, and are there techniques to address this challenge?	5 5								
4.	a) What are some common loss functions used in backpropagation for various tasks like regression and classification, and how are they selected? b)) Design logical AND using Perceptron network for bipolar inputs and targets?	5 5								
Section-C										
5.	a) Can you explain concept of associative recall in context of associative memory, and how it enables retrieval of related information? b) Compare auto-associative memory and hetro-associative memory. What is the other name of Auto-associative net?	5 5								
6.	a) Discuss the benefits of using PCA as a preprocessing technique before feeding data into a neural network. How can PCA help address issues like multicollinearity, overfitting, and computational complexity in neural network models? b) What are some considerations for selecting appropriate hyperparameters when building and training a Radial Basis Network?	5 5								
7.	a) Use Kohenon self-organizing maps for clustering given four vectors(0100), (0011) and (1100). Assume own initial weights and learning rate b) Can you provide an example of a real-world application where Self-Organizing Maps have been successfully employed for data analysis or pattern recognition?	6 4								

x-x-x