Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (COMPUTER SCIENCE AND ENGINEERING)

END SEMESTER EXAMINATIONS, JAN-MAY, 2023

DEEP LEARNING [CSE 5051]

(OPEN ELECTIVE)

Date: 02/06/2023 [9:30 AM – 12:30 PM]

Time: 3 Hours MAX. MARKS: 50

Instructions: Answer ALL the questions.

1A. Recognize the different methodologies to decide on how many hidden layers and how many neurons on each hidden layer in a neural network? **4M**

1B. Interpret the following activation functions with their activation formulae and related graphs:

i) Sigmoid ii) Hyperbolic tangent **3M**

1C. Sketch the flow diagram of back propagation algorithm of a neural network. **3M**

2A. Solve for the Softplus activated value of the neurons on output layer shown in Fig. Q2A. Your numerical answers you write must be approximated to four decimal places after the decimal point.

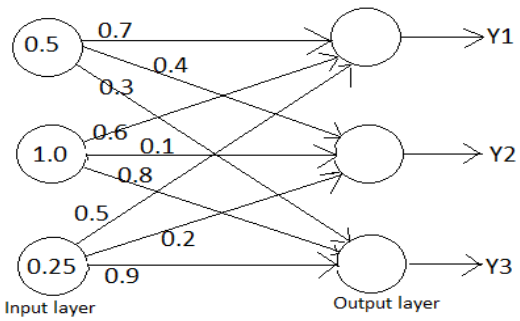


Fig. Q2A **4M**

2B. Differentiate the parameters and hyperparameters in a neural network? **3M**

2C. Interpret local minima and global minima with relevant graph. Also identify the possibility of existence of saddle point in it. Explain them. **3M**

3A. It is required to train the Restricted Boltzmann Machine (RBM) neural network with the data provided in the data set as shown in Fig. Q3A. The data set shows the interest of two players in 4 games namely Cricket, Football, Hockey and Chess. The likeness of a player towards a game is identified as 1 and 0 means player does not like that game. IN and OUT are the two latent variables used for indoor and outdoor game respectively. Assume all the initial weight values to be 0.5, the bias values of each neuron in the visible layer and in the hidden layer to be 0.3 Sketch a complete RBM network for the specified data.

2M

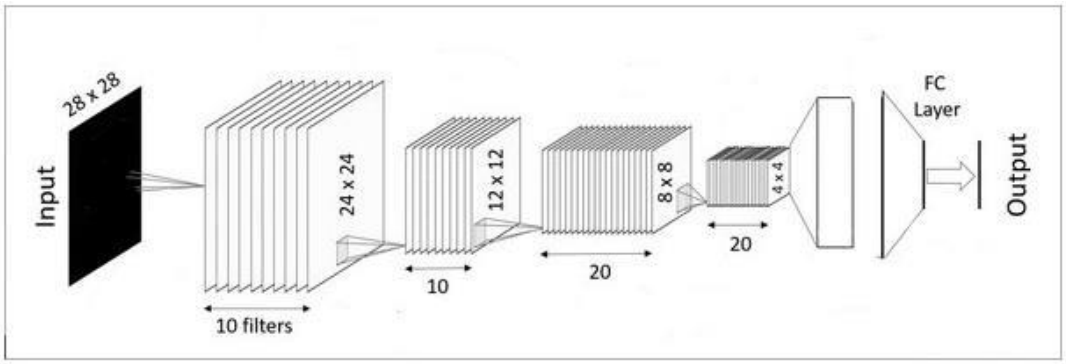
Records	Cricket	Football	Hockey	Chess	Class
PLAYER 1	0	0	0	1	IN
PLAYER 2	1	1	1	0	OUT

Fig. Q3A

3B. For the question Q3A, implement the contrastive divergence algorithm to train your RBM neural network sketched with the PLAYER 2 data only for one iteration. Given the learning rate as 0.5
Your numerical answers you write must be approximated to four decimal places after the decimal point. **5M**

3C Differentiate a simple Recurrent neural network (RNN) from a Deep neural network (DNN). Discuss and prove the vanishing / exploding gradient problem is much worse in simple RNN than DNN. **3M**

4A.



In Fig.2 is a CNN with the given input being a gray scale image.
a) Identify the possible layers appearing in the above CNN.
b) Solve to show your respective calculations in getting the respective outputs.
c) Discuss on its FC layer if the dropout ratio is given as 0.5
d) Why the dropout layers are to be considered in CNN? Discuss. **5M**

4B. Using McCulloch Pitt model principles, design a neural network with XOR gate functionality. Use the combination of available neural networks with functionalities OR and AND gates. x1 and x2 are the two inputs and Y is the output of the neural network. **3M**

4C Analyze how the designed neural network in Q4B works? **2M**

5A. Interpret how the Generator and the Discriminator training is done in Generative adversarial network with relevant diagram. **5M**

5B. Use the diagram that you have drawn in Q5A to write the mathematical equation of training the Generative adversarial network. Give a detailed explanation to every component in the equation you have written. **5M**