MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

II SEM M. Tech (BME) DEGREE END SEMESTER EXAMINATIONS, MAY/JUNE-2023
SUBJECT: DEEP LEARNING (BME 5271)
(REVISED CREDIT SYSTEM)
Monday, 22nd May, 2023; 9.30 AM To 12.30 PM

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to Candidates:

1. **Answer ALL questions**
2. **Draw diagrams wherever necessary**
3. **Missing data may be suitably assumed**

Q No.	Question	Marks
1 a.	Develop XOR Boolean function using Network of Perceptron model.	5
1 b.	Develop AND Boolean function using McCulloch Pitts (MP) neuron model and give the geometric interpretation.	3
1 c.	Identify some limitations of McCulloch Pitts (MP) neuron model.	2
2 a.	Consider a 3-layered Neural Network for k-class classification problem. As a part of backpropagation algorithm deduce the gradients with respect to the output units.	5
2 b.	Write the parameter update rule for Adam optimization technique and infer the need of bias correction in this technique.	3
2 c.	Explain the drawback of large learning rate and propose any 2 practical tips to overcome this problem.	2
3 a.	Choose and justify the activation functions that can be used at the hidden layers and output layer of an Autoencoder for a given binary input.	5
3 b.	Choose and justify the loss function of the autoencoder is to reconstruct $\hat{\boldsymbol{x}}_{\boldsymbol{i}}$ as close to $\boldsymbol{x}_{\boldsymbol{i}}$ as possible. Consider $\boldsymbol{x}_{\boldsymbol{i}}$ is a real-valued input.	3
3 c.	Explain under complete and over complete Autoencoder.	2
4 a.	Explain how a Sparse Autoencoder will handle the overfitting problem.	5
4 b.	Examine the training of the Neural Network if the all the weights of the Network are initialized to zero. Recommend the solution for this problem.	3
4 c.	Justify why ReLU neurons suffer from vanishing gradients.	2

5 a.	Deduce how ensemble methods such as Bagging technique will reduce generalization errors in Deep Neural Networks.	5
5 b.	Recommend a better network weight initialization strategy to overcome the problem of vanishing gradients.	3
5 c.	Explain how gradients will vanish in the case of sigmoid neurons.	2