JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

B.Tech-I Semester (CSE)

COURSE CODE (CREDITS): **25B11CI511 (3)** MAX. MARKS: 35

COURSE NAME: **Deep Learning**

COURSE INSTRUCTORS: **Dr. Kushal Kanwar** MAX. TIME: 2 Hour

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1	Explain why activation functions are necessary in neural networks. Discuss how they introduce non-linearity and prevent the network from collapsing into a linear model. Then compute the following: Given the input value x=−1.2 (a) Compute the output of the Sigmoid, Tanh, and ReLU functions. (b) Which activation function would you choose for deep networks and why?	4	3+1+1
Q2	Describe the role of the input gate, forget gate, and output gate in an LSTM cell. Explain how they help in handling long-term dependencies. Then compute: Given: Forget gate = 0.8, Input gate = 0.4, Candidate cell state = 0.5, Previous cell state C(t−1)=1.0 Compute the new cell state C(t).	4	4+1
Q3.	Explain the difference between the update gate and reset gate in a GRU. Compare GRU with LSTM in terms of structure and efficiency.	5	5
Q4.	What is an autoencoder? Explain the role of encoder and decoder. Then compute: If the input vector is **[4,6]** and the encoder compresses it to a single latent value by averaging, compute the latent representation.	4	4+1
Q5	Explain why autoencoders are used for dimensionality reduction. How do undercomplete autoencoders prevent overfitting? Given original input **x=[2,3,5]** and reconstructed output **x'=[1.5,2.5,4]**, compute the Mean Squared Error (MSE).	5	3+2
	Please Turn Over		

Q6	Explain the basic architecture of a GAN, describing the role of the generator and discriminator. Give one real-world application where GANs are widely used. If the generator produces an image with probability 0.72 of being fake and the discriminator incorrectly marks it as real, what is the discriminator error rate for this sample?	5	4+1
Q7	Explain the standard minimax loss function of a GAN and describe how the generator and discriminator optimize opposite objectives. Then compute the following: Given the discriminator outputs: For a real image: D(x) = 0.9 For a fake image generated by G: D(G(z)) = 0.2 Compute the discriminator loss using: **L_D = – [log(D(x)) + log(1 – D(G(z)))]**	5	3+2