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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science and Engineering
Final Examination, Spring-2025
Course Code: CSE445, Course Title: Natural Language Processing
Level: 4 Term: 1 Batch: 60

Time: 2 Hours **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a)	Draw the architecture of LDA? Is Topics Modeling and Topic Distribution are same, Justify your answer?	[5]	CO2
	b)	Apply Topic Modeling for the following scenarios when corpus contains three document for two topics Topic 1: Animals and wildlife Topic 2: Sports for following conditions: alpha=0.1 and beta=0.01. D1: "Lion hunts gazelle in the savanna." D2: "Elephants and giraffes live in Africa." D3: "Soccer players score goals in the stadium."	[10]	
2		Consider a neural network with two hidden layers, using a sigmoid activation function. The network performs a regression task, and the output layer has a single neuron. Now draw the Neural Networks and Apply chain rule to update the weights(w_{11}) when learning rate 0.01 You are given the following: Inputs: $x_1 = 0.5$, $x_2 = 0.3$ and output=1 Weights and Biases: Input to Hidden Layer 1(h1,h2,h3): $w_{11} = 0.4$, $w_{12} = 0.6$ $w_{21} = 0.5$, $w_{22} = 0.9$ $w_{13} = 0.3$, $w_{23} = 0.7$ $b_{h1} = 0.1$, $b_{h2} = 0.2$, $b_{h3} = 0.1$ Hidden Layer 1 to Hidden Layer 2(h4,h5): $w_{h11} = 0.4$, $w_{h12} = 0.5$, $w_{h31} = 0.6$ $w_{h21} = 0.7$, $w_{h22} = 0.9$,$w_{h32}=0.8$,$b_{h4} = 0.2$, $b_{h5} = 0.1$ Hidden Layer 2 to Output Layer: $w_{h41} = 0.3$, $w_{51} = 0.7$, $b_o = 0.1$	[10]	
3.	a)	Explain how Recurrent Neural Networks (RNNs) are used in language modeling for next-word prediction. Illustrate your answer with a simple example.	[4]	CO3
	b)	Discuss the limitations of standard RNNs and how they can be addressed using advanced architectures such as LSTM.	[4]	
	c)	Discuss Large Language Models (LLMs) by explaining their definition, core architectural components, and typical use cases. In your response, describe the roles of token embedding's, attention mechanisms, and decoder blocks within the LLM architecture. Additionally, explain how prompt phrasing can influence the outputs of an LLM, providing at least two clear examples to support your explanation.	[7]	