

3.	<p>Scenario 1: A new grammar is proposed with the following rules: $S \rightarrow aSBC aBC$ $CB \rightarrow BC$ $aB \rightarrow ab$ $bB \rightarrow bb$ $bC \rightarrow bc$ $cC \rightarrow cc$</p> <p>Scenario 2: After that another Context Free Grammar is proposed $S \rightarrow AB$ $A \rightarrow aA \epsilon$ $B \rightarrow bB \epsilon$</p>		[CO2]
	a) Classify this grammar within the Chomsky hierarchy (Type-0 to Type-3) and justify your answer.	[3]	
	b) From Scenario 2: Convert the grammar to CNF, now Discuss that the derived language remains unchanged	[2]	
4.	<p>a) In a manufacturing company, four distinct machines denoted as M_1, M_2, M_3, and M_4 are responsible for producing widgets. M_1 produces 10% of the total widgets, M_2 produces 20%, M_3 produces 30%, and M_4 produces 40%. The defective rates for the respective machines are 4%, 6%, 2% and 5%. If a randomly selected widget is found not to be defective, Identify the probability that it was produced by M_3.</p> <p>b) Explain the different reasons for uncertainty encountered in Artificial Intelligence systems and discuss how these uncertainties affect AI decision-making processes.</p>	<p>[3]</p> <p>[2]</p>	[CO2]
5.	<p>Read the scenario carefully and answer the associate question: Daffodil International University (DIU) has implemented a Smart Authentication System to control access and track attendance across multiple zones, such as classrooms, labs, and the library. The system uses a combination of biometric scans, RFID cards, and face recognition technology. The goal is to automate attendance logging and ensure only authorized individuals can access restricted areas.</p> <p>The system uses a perceptron-based decision model to compute a confidence score based on three key inputs: x_1: Biometric match score (0 to 1), x_2: RFID card validity (1,0), x_3: Face recognition score (0 to 1). Each input has an associated weight: $(W_1, W_2, W_3) = (0.5, 0.3, 0.2)$. The system grants access and logs attendance if the weighted sum of the scores is greater than or equal to a threshold $(\theta) = 0.7$. Otherwise, the system denies access and marks the attempt for manual review.</p> <p>a) A student attempts to enter the Laboratory with the following inputs:</p> <ul style="list-style-type: none"> • Biometric match = 0.8 • RFID validity = 1 • Face recognition score = 0.6 <p>Now, Examine the weighted sum and determine if the student is granted access to the laboratory. Show all steps clearly.</p> <p>b) Analyze how the system demonstrates the concepts of perception and computation in the decision-making process for accessing different zones at DIU. Also, mention one advantage and one challenge of using this automated system in the library and classrooms at DIU.</p>	<p>[5]</p> <p>[5]</p>	[CO4]