

3.	Scenario 1: A new grammar is proposed with the following rules: $S \rightarrow aSBC aBC$ $CB \rightarrow BC$ $aB \rightarrow ab$ $bB \rightarrow bb$ $bC \rightarrow bc$ $cC \rightarrow cc$ Scenario 2: After that another Context Free Grammar is proposed $S \rightarrow AB$ $A \rightarrow aA \epsilon$ $B \rightarrow bB \epsilon$		[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.	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. b) Explain the different reasons for uncertainty encountered in Artificial Intelligence systems and discuss how these uncertainties affect AI decision-making processes.	[3] [2]	[CO2]
5.	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. 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. a) A student attempts to enter the Laboratory with the following inputs: - Biometric match = 0.8 - RFID validity = 1 - Face recognition score = 0.6 Now, Examine the weighted sum and determine if the student is granted access to the laboratory. Show all steps clearly. 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.	[5] [5]	[CO4]