Continuous Assessment Test (CAT) – II - March 2025

Programme	:	B. Tech CSE & its specialization	Semester	:	Winter 24-25
Course Code & Course Title	:	BCSE401L - Internet of Things	Slot	:	A2+TA2
Faculty	:	Dr. Kabilan K Dr. Deepika Roselind J Dr. Avuthu Avinash Reddy	Class Number	:	CH2024250502004 CH2024250502005 CH2024250502006
Duration	:	90 Mins	Max. Mark		50

General Instructions:
Write only your registration number on the question paper in the box provided and do not write other information.

Answer all questions

Q. No	Sub Sec.	Description	Marks
1.		A large-scale farm is facing challenges in monitoring soil moisture, temperature and crop health due to its vast size. They plan to implement a LoRaWAN-based IoT system. i. How does LoRaWAN help address the challenges of remote monitoring in large farms compared to other wireless technologies like Wi-Fi or cellular networks? [2 M] ii. What factors should the farm consider before deploying LoRaWAN for sensor communication, and how would you justify using it over alternative technologies? [2 M] iii. Design a smart farming solution using LoRaWAN that optimizes water usage and improves crop yield. What additional technologies would you integrate? [6 M]	10
2.		An email provider develops an AI model to detect spam emails. Initially, the model relies on a simple perceptron based approach that classifies emails based on specific keywords such as "free," "prize," or "win." However, scammers adapt by altering their wording or using sophisticated techniques like misspellings and hidden characters, causing the system to fail in detecting newer spam messages. The company decides to upgrade its approach to enhance the model's adaptability and improve spam detection. i. Why current perceptron based model fail to detect advanced spam emails? Give an example of how spammers modify their messages to bypass detection. [5M] ii. Suggest advanced model architecture that handles complex spam patterns. Describe its key features and classification accuracy. [5M]	10

3.		A developer is choosing between IEEE 802.15.4 and Wi-Fi for a wearable health monitoring device that needs long battery life and reliable short-range communication. Evaluate the advantages and disadvantages of using IEEE 802.15.4 for this application compared to Wi-Fi. Which would you recommend and why?	10
4.		A financial institution wants to assess the credit risk of loan applicants based on multiple factors such as income, age, credit score, outstanding debt, number of credit cards, and past loan repayment history. However, with so many variables, analysing patterns and making quick decisions becomes challenging. To simplify the dataset while retaining essential information, the bank applies Principal Component Analysis to reduce dimensionality. After applying PCA, they identify a few principal components that explain most of the variance in credit risk assessment. i. Discuss how PCA helps the bank in improving its credit risk analysis. [4 M] ii. Apply your understanding of PCA to analyse the possible trade-offs a bank might encounter when reducing the number of features in credit risk assessment. [3 M] iii. If PCA is applied before a machine learning model, how could it impact the model's accuracy and interpretability? [3 M]	10

An autonomous vehicle classification system uses k-Nearest Neighbour (kNN) to classify road signs based on features like shape, colour, and reflectivity. The dataset consists of 10,000 training samples, and the system currently uses k=3 for classification. The training dataset is given below:

ID	Shape	Colour	Reflectivity	Class
1	8.0	2.0	9.0	1 (Stop)
2	7.5	2.2	8.5	1 (Stop)
3	6.0	3.0	7.0	0 (Yield)
4	6.2	2.8	7.5	0 (Yield)
5	8.5	2.1	9.2	1 (Stop)

5.   10

i. Assume that a new road sign is detected with the following attributes: shape = 7.0, colour = 2.5 and reflectivity = 8.0. Compute the Euclidean distances between the new road sign and each training sample. Which three training samples are the nearest neighbours? [5 M]

ii. Based on majority voting among the three nearest neighbours, what class should the system assign to the new road sign? [2 M]

iii. How does the choice of 'k' affect classification accuracy? If 'k' was increased to 5, would the classification change? [3 M]

**********All the best *************