Time:3 Hours **Marks: 80**

Instructions:
(1) Question 1 is Compulsory.
(2) Assume suitable data wherever required but justify it.
(3) Solve any THREE from Question No. 2 to 6.
(4) Figure to the right indicates full marks.

Q.1 **5 marks each**

(a) Explain Bayes theorem.

(b) Consider two fuzzy sets.

$$\tilde{A} = \left\{\frac{0.3}{1} + \frac{0.4}{2} + \frac{0.5}{3} + \frac{0.6}{4}\right\}$$

$$\tilde{B} = \left\{\frac{0.1}{1} + \frac{0.2}{2} + \frac{0.2}{3} + \frac{0.1}{4}\right\}$$

Find the algebraic sum, algebraic product, bounded sum, and bounded difference of the given fuzzy sets.

(c) Explain Mc-Culloch-Pitts neuron with an example.

(d) Explain bootstrap for sampling.

Q.2 **10 marks each**

(a) Explain Ensemble Methods.

(b) Define Cognitive Computing. Draw a neat diagram of components of the cognitive system and explain the components.

Q.3 **10 marks each**

(a) Explain the components of ANN architecture.

(b) Perform a case-study on video recommendation system (data science based)

Q.4 **10 marks each**

(a) Define Defuzzification. Discuss any two methods of defuzzification?

(b) What is the Bayesian Belief Network? Illustrate with an example.

Q.5 **10 marks each**

(a) Describe Natural Language Processing in Support of a Cognitive System.

(b) Explain in detail the Long Short-Term Memory Network with an example.

Q.6 **10 marks each**

(a) Define Accuracy, precision, and recall.

Evaluate performance of classifier1 and classifier 2 on the basis of above evaluation parameters, given following confusion matrix, where

F = actual fraud, F'= predicted, N = actual no. fraud and N' = predicted no. fraud

Classifier 1

	F'	N'
F	20	10
N	10	60

Classifier 2

	F'	N'
F	0	15
N	5	80

(b) Write a short note on- Trends in Data Science for audio.

Time: 3 hrs Marks: 80

Note: 1. Question 1 is compulsory
2. Answer any three out of remaining questions
3. Assume suitable data where required

Q1	Solve any 4	
a)	Explain Bluetooth Low Energy(BLE) role	5
b)	Briefly elaborate the COAP	5
c)	Explain data retention strategy.	5
d)	Explain the concept of I-IoT and its similarity with IoT	5
e)	Explain the characteristic of IoT	5
Q2		
a)	How can IoT analytics be effectively utilized within IoT-based healthcare systems? Additionally, what are some essential parameters that should be incorporated into the patient dashboard for comprehensive monitoring and management of health data?	10
b)	Evaluate long-range communication systems and protocols such as LTE, LTE-A, LoRa, and LoRaWAN in the context of IoT connectivity. Discuss their suitability for different IoT use cases based on factors like coverage, data rate, power consumption, and scalability.	10
Q3		
a)	Define the role of analytics in IoT technology and elaborate the challenges associated with it.	10
b)	Elaborate the need of new network architecture in IoT.	10
Q4		
a)	Compare edge, fog and cloud computing w.r.to its hierarchy.	10
b)	Consider smart smoke detection system. Elaborate its working and list down the different types of sensors and actuators required during the deployment scenario.	10
Q5		
a)	Explain the role of HTTP, WebSocket, and MQTT in IoT communication. Compare and contrast these protocols in terms of their characteristics, suitability for different IoT scenarios, and support for real-time data transmission.	10
b)	Discuss the functional blocks of IoT architecture, highlighting their roles and interactions. Provide examples to illustrate the importance of each block in the overall functionality of IoT systems.	10
Q6		
a)	Elaborate the Smart Object with diagram and describe its characteristics.	10
b)	Explain the following access technologies with applications area of each 1) IEEE 802.15.4 2) Z-wave 3) LTE-A	10

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