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.
