Reg. No……..…….. Name……

M. Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2025

SEMESTER 2 : Computer Science (Artificial Intelligence)

COURSE: **24P2CAIT08 : MACHINE LEARNING**

(*For Regular 2024 Admission)*

Time: Three Hours Max. Weightage : 30

PART - A **Weight : 1**

Answer any 8 Questions

1. In a real-life scenario where an online education platform predicts student performance based on their past grades and study hours, identify the type of learning paradigm used and justify your answer. (U, CO1)
2. Discuss the basic components of the learning process. (U, CO1)
3. Describe how SVD is used in image compression. (A, CO2)
4. Illustrate the concept of hyperplane in the context of SVM (An, CO2)
5. Explain how optimal “k” is determined in K-means clustering. (A, CO3)
6. Describe Self Organizing maps and its applications. (A, CO3)
7. Discuss the importance of the TensorFlow computation graph and session in executing operations. (A, CO4)
8. Assume in a markov model, the states are : 1. Rainy (R) 2. Cloudy (C) 3. Sunny (S). Assume the initial probability as Π(R)= 0.4 Π(C)= 0.3 Π(S)= 0.3 Compute the probability of observing SRCRSCS given that today is S. (A, CO4)

	Rainy	**Cloudy**	**Sunny**
Rainy	0.5	0.3	0.2
Cloudy	0.2	0.4	0.4
Sunny	0.1	0.1	0.8

9. Explain the architecture and working principles of Deep Belief Networks. (A, CO5)
10. Outline the working of Convolutional Neural Networks. (An, CO5)

(1 x 8 = 8)

PART- B **Weights : 2**

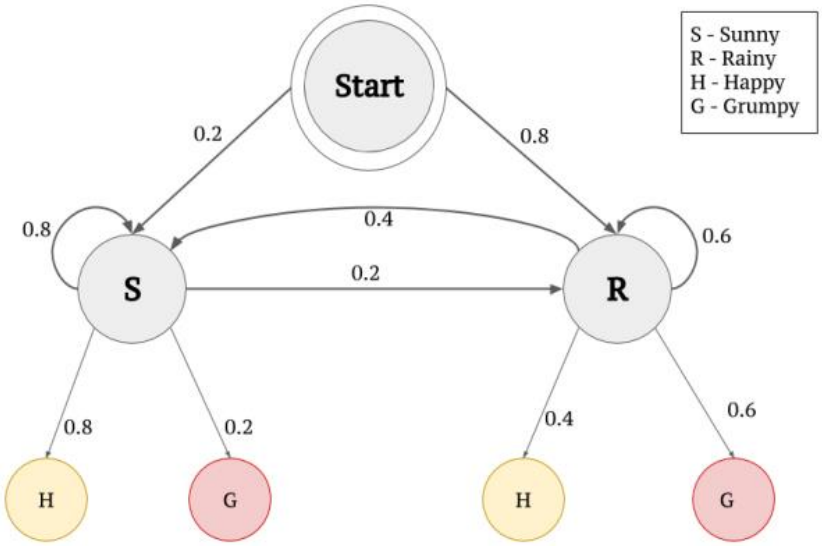
Answer any 6 Questions

11. Discuss the general classes of machine learning problems. (U, CO1)
12. Differentiate between PCA and SVD with suitable examples. (A, CO2)
13. Compare and contrast biological neural network and artificial neural networks. (An, CO2)

14. Differentiate between Linear and Logistic regression with necessary examples. (An, CO3)

15. Given the following dataset with 2D points: {(1,1), (2,2),(3,3),(8,8),(8,9),(25,80)}
Apply DBSCAN clustering with the following parameters: Epsilon - 3, Minpts = 2.
a) Identify the clusters formed by DBSCAN. (A, CO3)
b) Indicate which points are classified as noise.

16. Apply the Viterbi Algorithm to decode the hidden state sequence of the observation: **Grumpy, Grumpy.** (A, CO4)



17. Describe how you would define and use a "placeholder" in TensorFlow. Include an example of feeding data into a placeholder. (A, CO4)

18. Examine the process of training the LSTM model. Discuss the differences between training an LSTM and a standard feedforward neural network. (An, CO5)

(2 x 6 = 12)

PART- C **Weights : 5**

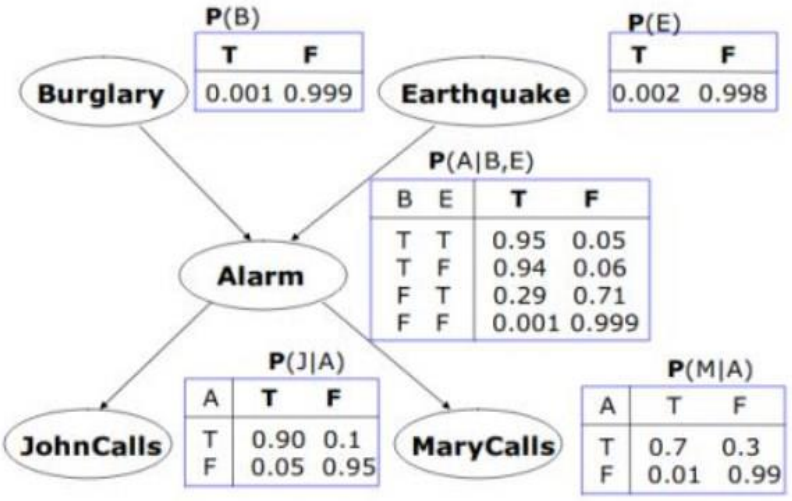
Answer any 2 Questions

19. Explain the three primary paradigms of Machine Learning — Supervised, Unsupervised, and Reinforcement Learning. Discuss their core principles, Key differences, and support your answer with clear real-life examples for each. (U, CO1)

20. Elaborate on all the different types of "linkage" criteria used in AGNES to determine the "distance" between clusters at each iteration with equations. (A, CO2)

21. i) Analyze the structure and working of Bayesian Belief Networks (BBNs). Explain how they represent probabilistic relationships among variables and how inference is performed in these networks. (A, CO3)

ii) Given the following scenario: Burglary can trigger the alarm. An earthquake can also trigger the alarm. If the alarm goes off, John and Mary may call Harry. Calculate the probability that the alarm has sounded, but there is neither a burglary nor an earthquake, and both John and Mary called Harry.



22. Explain the concept of Active Learning and discuss its key strategies. Provide realworld uses where Active learning is beneficial. (A, CO5)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total weight
CO1	Explain the fundamental paradigms of machine learning and U the principles of density estimation techniques.	U	1,2,11,19	9
CO2	Apply dimensionality reduction methods like PCA and SVD A and implement classification algorithms such as Perceptron, Feed Forward Network, and SVM.	A	3,4,12,13	6
CO3	Analyze clustering techniques and regression models to discover patterns and predict outcomes from data.	An	5,6,14,15,20	11
CO4	Evaluate the efficiency of probabilistic models like Bayesian Networks, HMMs, and CRFs, and apply TensorFlow for machine learning tasks.	An	7,8,16,17,21	11
CO5	Evaluate the performance and applicability of deep learning architectures like CNNs, RNNs, and LSTMs in solving real-world problems.	E	9,10,18,22	9

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R -REMEMBER;