Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 08-12- 2025 **Time:** 01:00pm – 04:00pm

School: SOE	**Program:** B. Tech	
Course Code: ECE3025	**Course Name:** AI Using Python	
Semester: V	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	12	12	19	19	19	19

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Plotting in Python is a versatile and effective way to visualize data. It enables users to create a wide range of visualizations, including line plots, scatter plots, bar charts, and histograms. What are the commands commonly used for plotting in Python.	**2 Marks**	**L1**	**CO1**
2.	A confusion matrix is a tool used to evaluate the performance of a classification model. Explain the concepts of **precision** and **recall** with a suitable example.	**2 Marks**	**L1**	**CO2**
3.	Unsupervised learning is a type of machine learning algorithm that identifies patterns or structures in data without the need for labeled outputs. Provide some applications for unsupervised learning.	**2 Marks**	**L1**	**CO3**
4.	How does the random forest algorithm, as an extension of the decision tree algorithm, work as both a classifier and a regressor?	**2 Marks**	**L2**	**CO3**
5.	K-Nearest Neighbors (KNN) is a supervised learning algorithm widely used for classification and regression tasks. Despite its effectiveness, it is categorized as a non-parametric model. What aspects of KNN's design and functioning make it non-parametric?	**2 Marks**	**L2**	**CO4**

6.	How does collaborative filtering leverage user and item interactions to make predictions or recommendations, and what are some real-world scenarios where this technique can significantly enhance user experience?	**2 Marks**	**L2**	**CO4**
7.	Why is item-based collaborative filtering often considered more effective than user-based collaborative filtering for recommending similar items, and what metrics would you use to evaluate its performance in terms of accuracy and relevance?"	**2 Marks**	**L2**	**CO5**
8.	Reinforcement learning is a sort of machine learning in which an agent learns to make decisions in an environment through trial and error. Distinguish between reinforcement learning and unsupervised learning.	**2 Marks**	**L2**	**CO5**
9.	How do reward and penalty mechanisms in reinforcement learning influence an agent's learning process, and what impact do they have on shaping optimal behavior in different environments?	**2 Marks**	**L3**	**CO6**
10.	What are some real-world applications of reinforcement learning?	**2 Marks**	**L3**	**CO6**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Discuss how supervised learning differs from unsupervised learning with respect to data requirements and learning objectives.	**10 Marks**	**L2**	**CO1**
		Or			
12.	**a.**	Outline the major differences between regression and classification with respect to prediction type and evaluation metrics	**10 Marks**	**L2**	**CO1**

13.	**a.**	Given the 2D data points [(1, 1), (1.5, 1.2), (2, 2), (8, 8), (8.2, 8.1), (9, 9)], how would the Mean Shift algorithm iteratively converge to segregate these points into clusters? Additionally, how does the choice of bandwidth influence the clustering outcome in this scenario?	**10 Marks**	**L2**	**CO2**
		Or			
14.	**a.**	Discuss the step-by-step procedure used in Mean Shift for density-based cluster formation. Also Explain with an example**.**	**10 Marks**	**L2**	**CO2**

15.	**a.**	How can Affinity Propagation be leveraged to identify distinct customer segments in a retail store based on their purchasing behavior, and what factors should be considered when selecting features such as frequency, recency, and monetary value to accurately capture these segments?	**15 Marks**	**L2**	**CO3**
		Or			

16.	**a.**	How can Affinity Propagation (AP) help in identifying natural groupings of stocks based on their behaviors, and how might the choice of similarity measures (e.g., price movements, volatility) influence the resulting clusters? What insights can these clusters provide about sectors or investment opportunities in the stock market?	**15 Marks**	**L2**	**CO3**

17.	**a.**	KNN is a supervised learning algorithm that is used to classify the new data. The table represents two columns: 'Height' and 'Weight. Find the class of new data.	**15 Marks**	**L2**	**CO4**

Height (CM)	**Weight (KG)**	**Class**
167	51	Underweight
182	62	Normal
176	69	Normal
173	64	Normal
172	65	Normal
174	56	Underweight
169	58	Normal
173	57	Normal
170	55	Normal
170	**57**	**?**

Or

18.	**a.**	KNN is a supervised learning algorithm that is used to classify the new data. The table represents two columns: '**Brightness**' and '**Saturation**'. Find the class of new data.	**15 Marks**	**L2**	**CO4**

Brightness	**Saturation**	**Class**
40	20	Red
50	50	Blue
60	90	Blue
10	25	Red
70	70	Blue
60	10	Red
25	80	Blue
20	35	?

19.	**a.**	Consider a matrix that shows four users, Alice, U1, U2, and U3, ratings on different news apps.The rating range is from 1 to 5 on the basis of users' likability of the news app.The '?' indicates that	**15 Marks**	**L3**	**CO5**

		the user has not rated the app.Calculate the ratings of Alice for BBC(I5).			

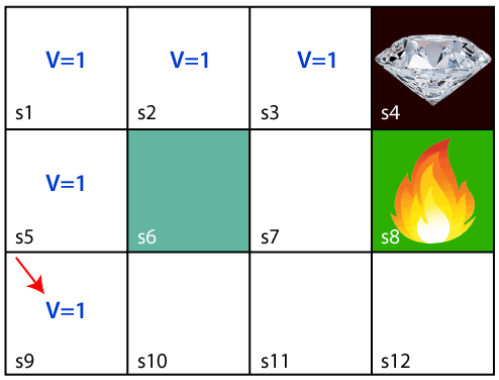
Name	Inshorts(I1)	HT(I2)	NYT(I3)	TOI(I4)	BBC(I5)
Alice	5	4	1	4	?
U1	3	1	2	3	3
U2	4	3	4	3	5
U3	3	3	1	5	4

Or

20.	**a.**	Given below is a set table that contains some items and the user who have rated those items. The rating is explicit and is on a scale of 1 to 5. Each entry in the table denotes the rating given by a i-th User to a j-th Item. In most cases majority of cells are empty as a user rates only for few items. We need to find the missing ratings for the respective user**.**	**15 Marks**	**L3**	**CO5**

User/Item	**Item_1**	**Item_2**	**Item_3**
User_1	2	-	3
User_2	5	2	-
User_3	3	3	1
User_4	-	2	2

21.	**a.**	In a maze environment, how can reinforcement learning algorithms balance exploration (trying new paths) and exploitation (choosing the most rewarding paths), and what strategies can be implemented to optimize this balance for faster and more efficient navigation?	**15 Marks**	**L3**	**CO6**



Or

22.	**a.**	The Markov property is used in reinforcement learning to represent the assumption that the future state of an environment depends solely on the current state and action taken rather than on the entire history of states and actions. How is this model adapted to this property? Explain the elements of this model.	**15 Marks**	**L3**	**CO6**