Academic Year (2021-22)	
Year: 3　　　Semester: VI	
Program: T.Y. Tech. (Computer Engg.)	**Max. Marks: 75**
Subject: Machine Learning	**Time: 10:30 am to 1:30 pm**
Date:　07/07/2022	**Duration: 3 Hours**
REGULAR EXAMINATION	

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.

(1) This question paper contains _02_ pages.
(2) **All Questions are Compulsory.**
(3) All questions carry equal marks.
(4) **Answer to each new question is to be started on a fresh page.**
(5) **Figures in the brackets on the right indicate full marks.**
(6) **Assume suitable data wherever required, but justify it.**
(7) Draw the neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	In a support vector machine, what is the quadratic programming approach for determining the maximum margin separators?.	[10]
	OR	
	How kernel functions are useful in non-linear classification in SVM?	[10]
Q1 (b)	Outline the steps involved in developing a machine learning application.	[05]
Q2 (a)	Which feature will be at the root node of the decision tree for predicting whether a mushroom is edible or not based on its shape, color and odor given in the following Table 1? Solve by calculating Gini Index.	[10]

Shape	Color	Odor	Edible
C	B	1	YES
D	B	1	YES
D	W	1	YES
D	W	2	YES
C	B	2	YES
D	B	2	NO
D	G	2	NO
C	U	2	NO
C	B	3	NO
C	W	3	NO
D	W	3	NO

Table 1

	OR Consider the following set of points :{ (-1,0),(0,2),(1,4),(2,5)}. Find the least square regression line for the given data points. Sketch best fitted line for the given data points.	[10]
Q2 (b)	Why logistics regression is called a type of Generalized Linear Models.	[05]
Q3 (a)	Illustrate the Expectation Maximization algorithm with help of example. **OR** Apply the Principal Component Analysis (PCA) for the given matrix A.	[10] [10]
Q3 (b)	Illustrate the singular value decomposition with example.	[05]
Q4 (a)	What are Hidden Markov Models (HMM)? How they are used in learning classification? Discuss the forward-backward procedure used in HMM. **OR** Illustrate the role of Radial Basis Function in separating nonlinear pattern?	[10] [10]
Q4 (b)	Explain backpropagation algorithm for Neural Network.	[05]
Q5 (a)	With the help of suitable example, discuss the elements of reinforcement learning?	[10]
Q5 (b)	Explain Deep Neural Network for Unsupervised Learning.	[05]

For Q3 (a) OR, the matrix:

$$A^T = \begin{array}{|c|c|c|c|} \hline 2 & 1 & 0 & -1 \\ \hline 4 & 3 & 1 & 0.5 \\ \hline \end{array}$$