MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)

END SEMESTER EXAMINATION, DECEMBER 2021

SUBJECT: OPEN ELECTIVE – PRINCIPLES OF SOFTCOMPUTING [CSE 4305]

REVISED CREDIT SYSTEM

(29/12/2021)

Time: 75 Minutes MAX. MARKS: 20

Instructions to Candidates:

- Missing data may be suitably assumed.

PART B

1A	With necessary mathematical equations show that if you derive training data from two linearly separable classes than there exists a solution.	5
1B	What are the three characteristics of Hebbian learning? State Hebbian hypothesis and its limitation. How it is overcome by Covariance hypothesis. State the important observations of Covariance hypothesis.	3
1C	Consider a Kohonen network with two cluster units and three input units. The weight vector for the cluster units are (0.9, 0.7, 0.6) and (0.4, 0.3, 0.5). Find the winning cluster unit for the input vector (0.4, 0.2, 0.1). Use learning rate $\eta = 0.2$. Also find new weights for the winning neuron.	2
2A	How do you represent energy function of discrete Hopfield network? Using this function, show that network will converge to a stable state.	5
2B	Explain the process of assigning membership values using intuition, inference, and rank ordering methods with an example for each. Use the inference approach to find the membership values for triangular shapes Isosceles, right angled, equilateral and others.	3

2C We want to compare two sensors based upon their detection levels and gain settings. The following table shows sensor detection levels for different gain settings. The item being monitored provides typical membership values to represent the detection levels of each of the sensors. 2

Gain Setting	Sensor S1 detection level	Sensor S2 detection level
0	0	0
20	0.5	0.45
40	0.65	0.6
60	0.85	0.8
80	1	0.95
100	1	1

Form the two fuzzy sets for sensors S1 and S2. Find the following membership functions using standard fuzzy set operations:

(a) $\mu_{s1 \cup s2}(x)$ (b) $\mu_{\overline{s1 \cup s2}}(x)$ (d) $\mu_{\overline{s1 \cap s2}}(x)$