MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
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VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
END SEMESTER ON-LINE PROCTORED EXAMINATIONS,
DECEMBER 2021

SOFT COMPUTING TECHNIQUES [ELE 4062]

REVISED CREDIT SYSTEM

Time:75minutes+10 minutes **Date: 27 December 2021** **Max. Marks: 20**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Time: 75 minutes for writing + 10 minutes for uploading.

1A. Classify the two dimensional input pattern shown in figure using perceptron network. The symbol '*' indicates the data representation to be +1 and 'o' indicates data to be -1. The patterns are I and F. For pattern I the target is +1 and for F the target is -1. Assume learning rate α to be 1. Use the bipolar activation function.

```
* * *        * * *
o * o        * * *
* * *        * o o
```

I F ***(04)***

1B. 1000 people responded to a questionnaire about their pairwise preferences among five car brands, X={Hyundai, Suzuki, Ford, Honda, Skoda} and the data is given in the table below. Complete the table and allot the Rank orders and select the highest membership function car brand.

	Hyundai	Suzuki	Ford	Honda	Skoda
Hyundai	-	192	246	592	621
Suzuki	403	-	621	540	391
Ford	235	336	-	797	492
Honda	523	364	417	-	608
Skoda	616	534	746	726	-

(03)

1C. Construct a max-net with four neurons. Assume inhibitory weight ε=0.2.

Given the following initial activation values.

a1(0)=0.3; a2(0)=0.5; a3(0)=0.7; a4(0)=0.9

Clearly write the activation function used. ***(03)***

2A. Compare medium wave and short wave receivers according to the given frequency range. Plot the membership function using intuition. The linguistic variables are defined based on the following. Represent using Gaussian membership function.

Medium wave receivers: frequency < 10^6 Hz

Short wave receivers: frequency > 10^6Hz ***(02)***

2B. Design a Fuzzy Logic Controller to determine the *wash time* of a domestic washing machine. Assume the inputs are *dirt* and *grease* on clothes. Use 3 descriptors (*small, medium, Large*) for input variables and 5 descriptors (*very small, small, medium, large, very large*) for output variables. Assume maximum wash time is 60 minutes. Determine wash time for 70% dirt and 80% grease using the designed model. ***(05)***

2C. Design a computer software to do image processing to locate objects within a scene of images in an overhead reconnaissance photograph. Two fuzzy sets are given below representing car and a truck image.

$$car = \left\{\frac{0}{truck} + \frac{0.5}{cycle} + \frac{0.65}{boat} + \frac{1}{car} + \frac{0.3}{house} + \frac{0.7}{cart}\right\}$$

$$truck = \left\{\frac{1}{truck} + \frac{0.45}{cycle} + \frac{0.6}{boat} + \frac{0.8}{car} + \frac{0.5}{house} + \frac{0.3}{cart}\right\}$$

Using Zadeh's notation Evaluate λ-cut sets(λ=0.5) for the following expressions:

(car U truck), (car ∩ truck), car', truck', (car U truck)', (car ∩ truck)'; ***(03)***