# END SEMESTER EXAMINATIONS (DECEMBER 2021/JANUARY 2022) - QUESTION PAPER - PART A (Copy)

COURSE CODE: ICE 4014COURSE NAME: Neural Network and Fuzzy LogicSEMESTER: VIIDATE OF EXAM: 17/12/2021DURATION: 45 + 5 minutes

## Instructions for Students:

 (1) ANSWER ALL THE QUESTIONS.
 (2) EACH QUESTION CARRIES 1 MARK.
 (3) YOU ARE INSTRUCTED TO INFORM THE INVIGILATOR AFTER SUBMISSION OF THIS FORM IN THE CHAT SECTION.

\* Required

\* This form will record your name, please fill your name.

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STUDENT NAME: \*

### **REGISTRATION NUMBER: \***

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A 4-input neuron has weights 2, 3, 4, and 5. The transfer function is linear, with the constant of proportionality being equal to 2. The inputs are 4, 10, 5, and 20, respectively. The output will be: (1 Point)

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A ------ system is a fuzzy system that uses a learning algorithm derived from or inspired by neural network theory to determine its parameters by processing data samples (1 Point)

Neuro fuzzy hybrid system

) Fuzzy Inference system

) Fuzzy neuro hybrid system

) Neuro genetic hybrid system

The value of output of the neuron Y for the single layer network with inputs [x1,x2,x3] = [0.8, 0.6, 0.4] and weights [w1,w2,w3] = [0.1, 0.3, -0.2] using bipolar sigmoidal function is (1 Point)

0.23
1
0.635
0.259

6

The value of net input for the network with inputs [x1, x2]=[0.2, 0.3] and the weights [w1, w2]=[0.3, 0.7] and bias 0.45 is (1 Point)

0.635
1.25
0.259
0.93

Let A be the fuzzy set being given below with the universe of discourse X=  $\{1,2,3,4,5,6\}$ . What will be the core and support for the fuzzy set created after complement of A? A= $\{0.5/1+1/2+0.3/3\}$ (1 Point)

```
Core={2}, Support={1,2,3}
```

```
Core={2,5}, Support={1,2,3}
```

```
Core={2,4,5}, Support={1,3,4,5,6}
```

```
Core={4,5,6}, Support={1,3,4,5,6}
```

```
8
(1 Point)
```

If A and B are two fuzzy sets with the universe of discourse X={1,: and their complements are given as  $\overline{A}$  and  $\overline{B}$  respectively. Which will not be true for A and B?



 $\bigcirc A \cap A^{-} = \emptyset$ 

Which is the following membership functions can have only a single membership value i.e 1 (1 Point)

- Sigmoidal membership function
- ) Triangular membership function
- ) Trapezoidal membership function
- ) Left Right membership function

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For a trapezoidal membership function specified by four parameters [w,x,y,z] which of the four points is/ are beginning of the full membership i.e 1 of the set (1 Point)

y only
w and y,
x and y

) x only

```
11
```

(1 Point)

Two fuzzy sets A and B with membership functions  $\mu_A(x)$  and  $\mu_B(x)$  resp as below

A=Hot climate with  $\mu_A(x)$  as the M.F

B= cold climate with  $\mu_B(x)$  as the M.F

Then pleasant climate is given by

- a. 1- $\mu_B(x)$
- b. max( $\mu_A(x), \mu_B(x)$ )
- c. min( $\mu_A(\mathbf{x}), \mu_B(\mathbf{x})$ )
- d. 1-µ<sub>A</sub>(x)
- a
  c
  b
  d

Which of the following is a fuzzy set?
1. $A = \left\{ \frac{x}{6} \le x \le 24, x \in X \right\}$
2. A={(x <sub>1</sub> , 0.5), (x <sub>2</sub> , 0.4), (x <sub>3</sub> , 0.75), (x <sub>4</sub> , 0.9)}
3. A={Spicy, sweet, Bland, Bitter, tasteless}

) 1 and 2

None of them is a fuzzy set

) 2 and 3

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For k<1, which of the following concept can be used to generate the linguistic hedge? (1 Point)

 $\bigcirc$ 

Both concentration and dilation

) None of these

Concentration only

Dilation only

```
14
```

## (1 Point)

Given two fuzzy sets with M.F  $\mu_A(x)$  and  $\mu_B(x)$  respectively Bounded d by

```
a. \mu_A(x). \mu_B(x)
b. \mu_A(x)+ \mu_B(x)- \mu_A(x). \mu_B(x)
c. min{1, \mu_A(x)+ \mu_B(x)}
d. max(0, \mu_A(x)+ \mu_B(x)-1}
```

```
  a
  c
  c
  b
  d
```

One difference between Mamdani approach and Takagi-Sugeno approach to FLC design is that

a. Mamdani approach needs defuzzification module whereas Takagi-Sugeno approach does not

b. Takagi-Sugeno approach does not require any fuzzification module whereas Mamdani approach needs

c. Takagi-Sugeno approach is more interpretable but less accurate d. All of the above

(1 Point)

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Suppose a fuzzy set *Young* is defined by

*Young*={(10,0.5), (20.0.8),(30,0.8),(40,0.5), (50,0.3)}

Then the crisp value of young using **MoM** method is (1 Point)

- 50
  25
  35
- 20

If the fuzzy set has two sub regions, then the center of gravity of the sub region----- can be used to calculate the defuzzified value (1 Point)

With the largest area





) With the median of the area

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## (1 Point)

For a	fuzz	y rel	ation	R, R	$k = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$	.7 .9 .8	0.2 0.5 0.3	0.3 1 0.7		alpha	cut relat	ion	for
A. $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$	1 1 1	1 0 1	B.	$\begin{bmatrix} 0\\1\\1 \end{bmatrix}$	0 0 0	0 1 0	C.	0 1 0	0 0 0	0 1 0	D. $\begin{bmatrix} 1\\1\\1\\1 \end{bmatrix}$	1 1 1	1 1 1
В													
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(

For Neuron, if w1=2, w2=-1 and input vector  $X=[0.8 \ 1.2]$  and desired output d=1, Determine value of net input (1 Point)



- ) Yin=0.4
- ) Yin=1

) Yin=0

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If x is A then y is B else y is C. The output of fuzzy rule is (1 Point)

a crisp seta fuzzy set



) a fuzzy relation

Question (1 Point)

Let P= 
$$\begin{bmatrix} 0.3 & 0.5 & 0.8 \\ 0 & 0..7 & 1 \\ 0.4 & 0.6 & 0.5 \end{bmatrix}$$
 Q=  $\begin{bmatrix} 0.9 & 0.5 & 0.7 & 0.7 \\ 0.3 & 0.2 & 0 & 0.9 \\ 1 & 0 & 0.5 & 0.5 \end{bmatrix}$ 

Where R=P°Q using max-min composition

$A = \begin{bmatrix} 0.8 \\ 1 \\ 0.5 \end{bmatrix}$	0.3	0.5	0.5	B=	0.3	0.5	0.
	0.2	0.5	0.7	0.5	0.2	0.8	0.
	0.4	0.5	0.6	0.5	0.5	0.5	0.
$C = \begin{bmatrix} 1 \\ 0.5 \\ 0.5 \end{bmatrix}$	1 0.5	0.5 0.5	0.5	$D = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 5 \end{bmatrix}$	1 0 5	1 0.8	: 0

- ОВ
- D
- ⊖ c
- () A

Which of the following neural networks uses supervised learning?

A. Multilayer perceptron

- B. Self-organizing feature map
- C. Hopfield network (1 Point)
- B only
- ) A only
- A and C only
- A and B only

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Following is the main point of difference between Adaline and Perceptron (1 Point)

- ) Analog activation value is compared with output
- ) All of the mentioned
- ) Sensory unit result is compared with output
- ) Weights are compared with output

The selling price of a house depends on the following factors. For example, it depends on the following factors. For example, it depends on the number of bedrooms, number of kitchen, number of bathrooms, the year of house built and the square footage of the lot. Given these factors, predicting the selling price of the house is an example of ------ task (1 Point)

) Multiple linear regression

) Simple linear regression

Multilabel Classification

) Binary classification

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Imagine a newly-born starts to learn walking. It will try to find a suitable policy to learn walking after repeated falling and getting up. Specify what type of ML algorithm is best suited to do the same. (1 Point)

) Supervised learning

Unsupervised learning

) Reinforcement learning

) Semi-supervised learning

State whether following statements are True or False

Statement A: Feature mapping converts a feature space into a pattern space Statement B: When the feature space is larger, overfitting is likely (1 Point)

) True, False

) True, True

) False, True

) False, False

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In determination of weights by learning, for orthogonal input vectors what kind of learning should be employed? (1 Point)

) no learning law

) hoff learning law

) hebb learning law

) widrow learning law

State whether following statements are True or False

Statement A: Learning vector quantization is unsupervised learning

Statement B: In kohonen self-organizing network feature map is a hidden layer and this acts as a competitive network (1 Point)

) True, False

) False, False

) True, True

) False, True

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For same size of training data as input, the fastest learning technique is (1 Point)

- ) Unsupervised training without error calculation
- ) Unsupervised training with Hebbian method
- ) Supervised training with gradient descent error correction
- ) Supervised training with stochastic method

In which learning method in the following those neurons which responds strongly to input stimuli have their weights updated (1 Point)

Stochastic

) Competitive

) Hebbian

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A batch mode of training is generally implemented through the------ in error calculation (1 Point)

- Maximization of median square error
- ) Minimization of median square error
- Maximization of mean square error
- ) Minimization of mean square error

The membership values of the membership function are nor strictly monotonically increasing or decreasing or strictly monoronically increasing than decreasing. (1 Point)

Normal

) Sub-normal

- Non Convex Fuzzy set
- Convex Fuzzy set

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