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 **PRESIDENCY UNIVERSITY**

  **Bengaluru**

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| **End - Term Examinations – JANUARY 2025** |
| **Date:** 03-01-2025 **Time:** 09:30 am – 12:30 pm |

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| **School:** SOCSE | **Program:** B.tech CSG/CST |
| **Course Code :**CSE3016 | **Course Name :** Neural Network and Fuzzy Logic |
| **Semester**: V | **Max Marks**: 100 | **Weightage**: 50% |

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| **CO – Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **26** | **24** | **26** | **24** |  |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

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| **Answer ALL the Questions. 10 x 2 Marks=20 Marks** |
| **1** | List the difference ANN with BNN. | **2 Marks** | **L1** | **CO1** |
| **2** | How ReLU activation function is different from Leaky ReLU activation function. | **2 Marks** | **L1** | **CO1** |
| **3** | Recall the applications of neural networks. | **2 Marks** | **L1** | **CO1** |
| **4** | What are the limitations of single layer perceptron compare to multilayer perceptron? | **2 Marks** | **L1** | **CO2** |
| **5** | Name any four supervised neural network models. | **2 Marks** | **L1** | **CO2** |
| **6** | AUA’≠U in fuzzy logic. Why? | **2 Marks** | **L1** | **CO3** |
| **7** | Let μA(X)={(x1,0.3), (x2,0.7), (x3,0.2), (x4,0.8), (x5,0.6)}. Compute strict α-cut(0.5) using μA(X).  | **2 Marks** | **L2** | **CO3** |
| **8** | Define compatibility relation in fuzzy set. | **2 Marks** | **L1** | **CO3** |
| **9** | Compare classical logic with multivalued logic. | **2 Marks** | **L1** | **CO4** |
| **10** | Describe Zadeh’s arithmetic rule. | **2 Marks** | **L1** | **CO4** |

**Part B**

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| **Answer ALL Questions. Each question carries 20 marks. 4QX20M=80M** |
| **11** | **11a** | Show that differentiation of tanh(x) is equal to (1-tanh2(x)). | **6 Marks** | **L3** | **CO1** |
| **11b** | Discuss in detail about Rosenblatt Model of Neural Network with suitable sketch. | **4 Marks** | **L2** | **CO1** |
| **11c** | Consider a neural network having two layers namely input and output. The input layer contains two inputs nodes and one bias node. The output layer holds one output unit. It also contains two normal weights. Construct a neural network model to compute NAND logic using Perceptron rule. | **10 Marks** | **L3** | **CO1** |
| **Or** |
| **12** | **12a** | Distinguish between hard computing and soft computing. | **4 Marks** | **L2** | **CO1** |
| **12b** | Prove that differentiation of σ(x)= σ(x)(1- σ(x)). | **6 Marks** | **L3** | **CO1** |
| **12c** | Consider a neural network having two layers namely input and output. The input layer contains two inputs nodes. The output layer holds one output unit. It also contains two normal weights. Construct a neural network model to compute y=x1x2’ logic using Hebb’s rule. | **10 Marks** | **L3** | **CO1** |
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| **13** |  | Consider a multi-layer neural network model given below contains three layers namely input, hidden and output. The input layer contains two nodes and bias node. The hidden layer also contains two nodes and bias node. The output layer contains two nodes. The activation function used in hidden and output layers are sigmoid. Determine the updated weights. neural_network (9) | **20 Marks** | **L3** | **CO2** |
| **Or** |
| **14** |  | Consider a radial basis function neural network which contains three layers namely input, hidden and output. The input layer contains two inputs nodes. The hidden layer four hidden nodes. The output layer contains one node. The activation function used in hidden and output layers are gaussian and binary activation function. Develop a model to compute a logic XOR using above scenario and deduce the weights. | **20 Marks** | **L3** | **CO2** |
|  |  |  |  |  |  |
| **15** | **15a** | Deduce the value of a using general bell shaped membership function when x=30, c=5, b=1, bell(x, a, b, c, σ)=0.7.  | **6 Marks** | **L3** | **CO3** |
| **15b** | Let A and B are two fuzzy sets where A={(1,0.3), (3,0.6), (5,0.7)} B={(2,0.5), (4,0.4), (6, 0.8)}. Compute A\*B using extensive principles of fuzzy set. | **6 Marks** | **L3** | **CO3** |
| **15c** | Suppose A and B are two fuzzy sets where A={(X1,0.3), (X2,0.6), (X3,0.7), (X4,0.4), (X5,0.2)} B={(X1,0.7), (X2,0.5), (X3,0.8), (X4,0.2), (X5,0.1)}. Prove that (A˅B)’= A’˄B’. | **8 Marks** | **L3** | **CO3** |
| **Or** |
| **16** | **16a** | Determine the value of a when sigmoid(x, a, c)=0.7, x=30, c=15.  | **6 Marks** | **L3** | **CO3** |
| **16b** | Suppose A and B are two fuzzy sets where A={(X1,0.3), (X2,0.6), (X3,0.7)} B={(Y1,0.7), (Y2,0.5), (Y3,0.8)} defined on X and Y. Find the cartesian product of A x B. | **6 Marks** | **L3** | **CO3** |
| **16c** | Let A and B are two fuzzy sets where A={(1,0.3), (3,0.6), (5,0.7)} B={(2,0.5), (4,0.4), (6, 0.8)}. Compute A+B, A-B using extensive principles of fuzzy set. | **8 Marks** | **L3** | **CO3** |
|  |  |  |  |  |  |
| **17** | **17a** | Discuss conditional and unqualified, conditional and qualified propositions with suitable example. | **6 Marks** | **L2** | **CO4** |
| **17b** | Suppose X={x1, x2, x3}, Y={y1, y2}, Z={z1, z2} universal sets. Let p={(x1,0.3), (x2,0.4), (x3,0.7)}, q={(y1,0.7), (y2,0.1)}, r={(z1,0.8), (z2,0.2)} are fuzzy sets defined on X, Y, and Z respectively. Verify generalized hypothetical syllogism. |  **10 Marks** | **L3** | **CO4** |
| **17c** | Let Young = {(x1,0.3), (x2,0.7), (x3,0.2), (x4,0.8), (x5,0.6)} be fuzzy set defined X. Determine Very Very Young, where Very=x2. | **4 Marks** | **L3** | **CO4** |
| **Or** |
| **18** | **18a** | Let us assume p: If X is A then Y is B is very true is a conditional and qualified proposition. A={(x1,0.3), (x2,0.7), (x3,0.2)}, B= {(y1,0.5), (y2,0.1)} defined on X and Y respectively. Here S stands for very true. Let s(a)=a3 for all a belongs to [0,1] given a fact that X is A’ where A’={{(x1,0.8), (x2,0.4), (x3,0.6)} then deduce Y is A’. | **12 Marks** | **L3** | **CO4** |
| **18b** | Let A and B are two fuzzy sets where A={(1,0), (2,0.3), (3,0.6), (4,0.3), (5,0) } B={(3,0), (4,0.2), (5, 0.4), (6,0.2), (7,0)}. Compute crisp value using center of sum and center of gravity model. | **8 Marks** | **L3** | **CO4** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***