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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **End - Term Examinations – JANUARY 2025** |
| Date: 07 – 01- 2025 Time: 09:30 am – 12:30 pm |

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| **School:** School of Engineering | **Program:** B.Tech-ECE | |
| **Course Code :** ECE3051 | **Course Name** : Machine Learning and Deep Learning using FPGA | |
| **Semester**: VII | **Max Marks**: 100 | **Weightage:** 50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **19** | **21** | **29** | **31** | **--** |

**Instructions:**

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

**Part A**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M** | | | | |
| **1** | Demonstrate the key components of Machine Learning. | **2 Marks** | **L2** | **CO1** |
| **2** | Explain the 'naive' assumption in the Naive Bayes classifier | **2 Marks** | **L2** | **CO2** |
| **3** | Outline the mathematical formula for Hamming Distance and Manhattan Distance. | **2 Marks** | **L2** | **CO1** |
| **4** | Distinguish between the Linear Regression and Logistic Regression. | **2 Marks** | **L2** | **CO2** |
| **5** | Develop the HDL code for Full adder using Half adder | **2 Marks** | **L3** | **CO2** |
| **6** | Illustrate the structure of the artificial neural network. | **2 Marks** | **L2** | **CO3** |
| **7** | Summarize the sigmoid activation function with its types. | **2 Marks** | **L1** | **CO4** |
| **8** | Outline the application of Neural Network in real time | **2 Marks** | **L2** | **CO4** |
| **9** | Explain the types of Neural Network models | **2 Marks** | **L2** | **CO4** |
| **10** | Distinguish between the Human Neuron Cell and the Artificial Neuron Cell. | **2 Marks** | **L2** | **CO3** |

**Part B**

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| **Answer the Questions. Total Marks 80** | | | | | |
| **11.** | **a.** | Analyze the neurons that have a sigmoid activation function to perform a forward pass and Backward pass on the network given. Assume that the actual output is 0.5 and the learning rate is 1. Prove that the error is reduced after the iteration. | **25 Marks** | **L4** | **CO3** |
| **Or** | | | | | |
| **12.** | **a.** | Examine the neural network for one complete cycle and calculate the error for the following with W1 = 0.11; W2 = 0.22; W3 = 0.33; W4= 0.44; W5 = 0.55; W6 = 0.66; W7=0.77; W8=0.88 & W9 = 0.99, Perform the forward and backward propagation for the following neural network to prove that the error is minimized. | **25 Marks** | **L4** | **CO4** |
|  |  |  |  |  |  |
| **13.** | **a.** | As shown in Figure, the Artificial Neural Network is given a target value of 1.0 and a learning rate of 0.9. Examine the Forward and Back Propagation for the given neural network to prove the decrement of error after the back propagation. | **25 Marks** | **L4** | **CO3** |
| **or** | | | | | |
| **14.** | **a.** | Develop the HDL code for the following floating values using the fixed point representation of 16 bits in LUT format.  a) x1 = 0.98765  b) x2 = 0.54321  c) x3 = 0.26543  d) x4 = 0.27841  e) x5 = 0.22899  f) x1 = 0.82654  g) x2 = 0.91122  h) x3 = 0.42683  i) x4 = 0.43215  j) x5 = 0.32177 | **25 Marks** | **L3** | **CO4** |

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| **15.** | **a.** | Develop the VHDL code for the decision tree as given below | **15**  **Marks** | **L3** | **CO2** |
| **Or** | | | | | |
| **16.** | **a.** | Make use of the given Table, consisting of 5 samples for students to clear the examination based on the number of hours utilized for studying. Now using the logistic regression, evaluate the following   1. Probability for a pass, if a student has studied for 33 hours. 2. Minimum required hours for a student to pass the examination that has a probability of more than 95%.  |  |  |  | | --- | --- | --- | | Sl. No.: | Hours of Study | Pass or Fail | | 1 | 29 | 0 | | 2 | 15 | 0 | | 3 | 33 | 1 | | 4 | 28 | 1 | | 5 | 39 | 1 | | **15 Marks** | **L3** | **CO1** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **17.** | **a.** | Utilize the Naïve Bayes classifier can be explained with the data sample to play the game of tennis considering the four classes as Outlook, Climate, Humidity, and Wind as given in Table below.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Day | Outlook | Climate | Humidity | Wind | Play Game | | 1 | Sunny | Hot | High | Weak | No | | 2 | Sunny | Hot | High | Strong | No | | 3 | Overcast | Hot | High | Weak | Yes | | 4 | Rain | Mild | High | Weak | Yes | | 5 | Rain | Cool | Normal | Weak | Yes | | 6 | Rain | Cool | Normal | Strong | No | | 7 | Overcast | Cool | Normal | Strong | Yes | | 8 | Sunny | Mild | High | Weak | No | | 9 | Sunny | Cool | Normal | Weak | Yes | | 10 | Rain | Mild | Normal | Weak | Yes | | 11 | Sunny | Mild | Normal | Strong | Yes | | 12 | Overcast | Mild | High | Strong | Yes | | 13 | Overcast | Hot | Normal | Weak | Yes | | 14 | Rain | Mild | High | Strong | No |   Predict the decision of playing the game of tennis for (Outlook = Sunny; Temperature = Cool; Humidity = High; Wind = Strong) | **15**  **Marks** | **L3** | | **CO1** |
| **Or** | | | | | | |
| **18.** | **a.** | Utilize the KNN algorithm to predict whether JOHN will be diabetic or not with the given attributes assuming the values of K = 3. Name: JOHN; Age: 40 and BMI: 43.6   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Sl. No | NAME | AGE | BMI | DIABETIC | | 1 | Reena | 50 | 33.6 | 1 | | 2 | Shiyamala | 30 | 26.6 | 0 | | 3 | Nithya | 40 | 23.4 | 0 | | 4 | Ganesh | 67 | 43.1 | 0 | | 5 | Mahesh | 23 | 35.3 | 1 | | 6 | Shakthi | 67 | 35.9 | 1 | | 7 | Sundar | 45 | 36.7 | 1 | | 8 | Anitha | 46 | 25.7 | 0 | | 9 | Parvin | 29 | 23.3 | 0 | | 10 | Anand | 56 | 31 | 1 | | **15**  **Marks** | **L3** | **CO2** | |

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