Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17EI2032** | **Duration :** | **3hrs** |
| **Sub. Name :** | **THEORY AND DESIGN OF NEURO FUZZY CONTROLLERS** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | With a neat sketch, illustrate the generation and propagation of action potential in a biological neuron as an electrochemical activity and there by bring out the analogy between Biological and Artificial Neural Networks. | CO1 | 15 |
| b. | With an example of XOR problem, show how the concept of linear inseparability is handled in a multilayer network. | CO2 | 5 |
| **(OR)** | | | | |
| 2. | a. | Draw the functional blocks of a Back Propagation Network and write the steps involved in the forward and reverse pass. | CO1 | 5 |
| b. | Derive the expression for the generalized delta learning rule in a Back Propagation Network. | CO2 | 15 |
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| 3. | a. | With a neat block diagram, explain feedforward control with plant inverse learning. Mention its advantages and disadvantages. | CO3 | 10 |
| b. | Mention the goal of the inverted pendulum task. With necessary graphs and explanations, explain how a neurocontroller is used to keep the pendulum from falling. | CO5 | 10 |
| **(OR)** | | | | |
| 4. | a. | Specify the control objective of the specialized learning control architecture. Sketch the functional blocks involved, its operation, merits and weaknesses. | CO3 | 10 |
| b. | Give the basic idea of a Cerebellar Model Articulation Controller. Draw the block diagram of the complete learning and control system and explain the process of characteristic surface build up by gradual adjustment of weights. | CO5 | 10 |
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| 5. | a. | Differentiate between Crisp Logic and Fuzzy Logic with a relevant example. | CO1 | 5 |
| b. | For ﬂight simulator data the determination of certain changes in operating conditions of the aircraft is made on the basis of hard break points in the Mach region. Let us deﬁne a fuzzy set to represent the condition of ‘‘near’’ a Mach number of 0.74. Further, deﬁne a second fuzzy set to represent the condition of ‘‘in the region of’’ a Mach number of 0.74. In typical simulation data a Mach number of 0.74 is a hard breakpoint.    For these two fuzzy sets ﬁnd the following: | CO2 | 15 |
| **(OR)** | | | | |
| 6. | a. | In a distillation coloumn, the relationship between the input variable, temperature, and the output variable, distillate fractions, is not precise but the human operator of this process has developed an intuitive understanding of this relationship. The universe for each of these variables is  X- universe of temperatures (◦F) X={160,165,170,175,180,185,190,195}  Y- universe of distillate fractions (percentages)  Y={77,80,83,86,89,92,95,98}  Two fuzzy sets A and B are defined on X and Y respectively as     1. Determine the proposition, IF ‘‘temperature is hot’’ THEN ‘‘separation of mixture is good’’ 2. If another fuzzy linguistic variable is defined as     for another fuzzy rule IF A’ THEN B’, find B’ using approximate reasoning. | CO5 | 15 |
| b. | Comment on the various methods of defuzzification. | CO2 | 5 |
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| 7. | a. | Draw the functional blocks of a fuzzy control system and explain the process with an example of level process. | CO5 | 15 |
| b. | Discuss the features of an adaptive fuzzy system. | CO4 | 5 |
| **(OR)** | | | | |
| 8. | a. | Enumerate the steps to design a fuzzy controller for blood pressure control during anesthesia. | CO4 | 10 |
| b. | Illustrate the application of hybrid control scheme using ANFIS tool box with a case study. | CO6 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Give the structure of Genetic Algorithm and explain the function of each step in detail. | CO4 | 10 |
| b. | With necessary explanations, bring out the underlying concept of machine learning using support vector machine classifier. | CO4 | 10 |