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



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

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| **Code :** | **17EI3005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **INTELLIGENT 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. | Signal transmission in a neuron is an electrochemical activity. Justify this statement with necessary explanations and diagrams. | CO1 | 10 |
| b. | Implement the delta rule training for a single layer network using a bipolar continuous activation function, η=0.25, λ=1 and the following data specifying the initial weights, and the two training pairs. . | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | With neat block diagrams, explain the weight adjustment mechanism in a backpropagation network and derive the generalized delta learning rule for it. | CO1 | 10 |
| b. | Describe in detail the discrete Hopfield NN with its architecture and training algorithm. | CO2 | 10 |
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| 3. | a. | With a neat block diagram, demonstrate feedforward control of a plant with plant inverse learning and the specialized online learning control architecture for a dynamic plant. | CO2 | 10 |
| b. | Show how a neural network learns an approximation of the system characteristics and uses it to generate the appropriate control signal. | CO2 | 10 |
| **(OR)** | | | | |
| 4. | a. | What is the goal of Inverted pendulum task? Show how a neuro-  controller is used to achieve the goal. | CO2 | 10 |
| b. | Mention the advantages of neurocontrollers over conventional controllers. | CO2 | 10 |
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| 5. | a. | Differentiate between classical and fuzzy sets. Bring out the significance of membership functions in fuzzification. | CO3 | 10 |
| b. | The objective in a distillation process is to separate components of amixture in the input stream. 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*)* = {160*,* 165*,* 170*,* 175*,* 180*,* 185*,* 190*,* 195}  Y = universe of distillate fractions (percentages) = {77*,* 80*,* 83*,* 86*,* 89*,* 92*,* 95*,* 98}  Now we define fuzzy sets A and B on X and Y, respectively:    Determine the proposition, IF ‘‘temperature is hot’’ THEN ‘‘separation of mixture is good,’’ or symbolically, A→B. From this,  (*b*) Now define another fuzzy linguistic variable as    and for the ‘‘new’’ rule IF A’THEN B’, find B’ using max–min composition. | CO3 | 10 |
| **(OR)** | | | | |
| 6. | a. | Classify the graphical techniques of fuzzy inference with relevant diagrams. | CO3 | 10 |
| b. | Comment on the various types of defuzzification techniques. | CO3 | 10 |
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| 7. | a. | With a neat diagram, show how a fuzzy controller can be used to control a level process. | CO4 | 10 |
| b. | Writa a short note on adaptive fuzzy system. | CO5 | 10 |
| **(OR)** | | | | |
| 8. | a. | Design a fuzzy controller for inverted pendulum. | CO5 | 10 |
| b. | Mention the advantages of hybrid neurofuzzy systems. | CO5 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Summarize the function of genetic operators and fitness functions in evolutionary computation. | CO6 | 10 |
| b. | Discuss about the optimization of travelling salesman problems using genetic algorithm. | CO6 | 10 |