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



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

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| **Code :** | **17EI3002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED PROCESS CONTROL** | **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. | Obtain the mathematical model of two interacting systems. | CO1 | 10 |
| b. | Distinguish between servo and regulatory control with examples. | CO1 | 5 |
| c. | Highlight the features of self regulating process with an example. | CO1 | 5 |
| **(OR)** | | | | |
| 2. | a. | Develop the mathematical model of CSTR. | CO1 | 10 |
| b. | Disscuss about the degrees of freedom for a stirred tank heater. | CO1 | 5 |
| c. | A temperature sensor has a transfer function of 5 mV/°C with an accuracy of ±1%.  i) Find the possible range of the transfer function.  ii) Suppose a reading of 27.5 mV results from a sensor, find the  temperature that could provide this reading. | CO1 | 5 |
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| 3. | a. | Calculate the PI controller output for the given Error Signal shown in the figure.  Given data: Kp=5, Ki=1sec-1 Pi(0)=20%. | CO2 | 10 |
| b. | Summarize the concept of Integral wind up and Auto/manual Transfer. | CO2 | 10 |
| **(OR)** | | | | |
| 4. | a. | Level measurement in a sump tank is provided by a transducer scaled as 0.2V/m. A pump is to be turned on by application of +5V when the sump level exceeds 2.0 m. The pump is to be turned back off when the sump level drops to 1.5 m. Develop a two position controller. | CO2 | 5 |
| b. | Analyze the characteristics of different types of control valves. | CO3 | 10 |
| c. | Highlight the control scheme for different processes. | CO2 | 5 |
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| 5. | a. | Differentiate between feedback and feedforward controller. | CO6 | 5 |
| b. | Discuss on the concept and applications of ratio control. | CO6 | 10 |
| c. | Evaluate the importance of averaging control. | CO6 | 5 |
| **(OR)** | | | | |
| 6. | a. | Design a cascade control for Jacketed CSTR. | CO6 | 10 |
| b. | Elaborate on the Ziegler Nicholas tuning technique based on frequency response analysis. | CO2 | 5 |
| c. | Consider a multicapacity process with  Determine the PID controller settings using Process Reaction Curve method. | CO2 | 5 |
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| 7. | a. | Obtain the model equations for a binary distillation column. | CO4 | 10 |
| b. | Consider a process with the following input-output relationships:  Select the loops using Relative gain Array. | CO4 | 10 |
| **(OR)** | | | | |
| 8. | a. | Assume that the input-output relationships of a process with two controlled outputs and two manipulated inputs are given by  Tune the controllers and analyse its stability. | CO4 | 10 |
| b. | Summarize the concept of interaction of control loops. | CO4 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Summarize the features of different types of adaptive controllers. | CO5 | 10 |
| b. | Sketch the block diagram of Internal Model Control and explain its concepts. | CO5 | 10 |