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



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

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| **Code :** | **17EI2006** | **Duration :** | **3hrs** |
| **Sub. Name :** | **CONTROL SYSTEM** | **Max. Marks :** | **100** |

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Write the differential equations governing the mechanical system shown in the figure and model its equivalent force-voltage analogy. | CO1 | 20 |
| **(OR)** | | | | |
| 2. | a. | Determine the overall transfer function C(s) / R(s) for the system shown below. | CO2 | 10 |
| b. | Find the overall gain of the system represented by signal flow graph below with input V1 and output V2. | CO2 | 10 |
|  |  |  |  |  |
| 3. |  | The open loop transfer function of a unity feedback system is given by . Evaluate the gain K, so that the system will have a damping ratio of 0.5. For this value of K, determine settling time, peak overshoot, time at peak overshoot for a unit step input. | CO2 | 20 |
| **(OR)** | | | | |
| 4. |  | The state model of the system is given by the following:    Determine transfer function of the system. | CO3 | 20 |
|  |  |  |  |  |
| 5. | a. | Inspect the Controllability and Observability for a system represented using the state model shown below. | CO3 | 15 |
| b. | List the properties of state transition matrix. | CO3 | 5 |
| **(OR)** | | | | |
| 6. |  | A unity feedback system is characterized by the open-loop transfer function       Using the Routh criterion, evaluate the range of values of K for the system to be stable. | CO4 | 20 |
|  |  |  |  |  |
| 7. | a. | For the open loop transfer function below, construct the rootlocus. | CO4 | 15 |
| b. | Define stability of a system. Illustrate stable, unstable and marginally stable systems. | CO4 | 5 |
| **(OR)** | | | | |
| 8. | a. | Construct bode plot for the transfer function below and determine the phase and gain cross over frequencies. | CO4 | 15 |
| b. | Define Gain Margin and Phase Margin. | CO2 | 5 |
|  | | **Compulsory**: |  |  |
| 9. | a. | The loop transfer function of a unity feedback system is given by . Develop polar plot and determine the gain margin and phase margin. | CO4 | 15 |
| b. | Write short notes on Lag-Lead compensator. | CO6 | 5 |