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



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

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| **Code :** | **14EI2005** | **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. | a. | Write the differential equations governing the mechanical system shown in fig and determine the transfer function. | CO1 | 15 |
| b. | List the basic elements used for modeling mechanical rotational system. | CO1 | 5 |
| **(OR)** | | | | |
| 2. | a. | Determine the transfer function X2(S)/F(S) of the system shown in fig.    f(t) | CO1 | 15 |
| b. | Distinguish between open loop and closed loop system. | CO1 | 5 |
|  |  |  |  |  |
| 3. | a. | Use Mason’s gain formula to determine the overall transfer function of the system shown in Figure. | CO2 | 15 |
|  | b. | Derive the transfer function of the network given in figure.  [Image result](https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=imgres&cd=&cad=rja&uact=8&ved=2ahUKEwjJgaLYnKfaAhUDvbwKHetsBuEQjRx6BAgAEAU&url=https://www.electrical4u.com/rl-circuit-transfer-function-time-constant-rl-circuit-as-filter/&psig=AOvVaw2resJTnr5JhyRODW-LO1A5&ust=1523158223399245) | CO2 | 5 |
| **(OR)** | | | | |
| 4. | a. | Determine the overall transfer function C(S)/R(S) for the system shown in figure using Block Diagram reduction rules. | CO2 | 15 |
| b. | For the system with following transfer function, determine type and order of the system.  i) ii) . Also find its poles. | CO2 | 5 |
|  |  |  |  |  |
| 5. | a. | Determine the stability of the system using Routh array method whose characteristics equation given by | CO3 | 15 |
| b. | Give any five rules used in the block diagram reduction techniues with an example. | CO2 | 5 |
| **(OR)** | | | | |
| 6. |  | The open loop transfer function of a unity feedback system is given by . Determine 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 and time at peak overshoot for a unit step input. | CO2 | 20 |
|  |  |  |  |  |
| 7. |  | The open loop transfer function of a unity feedback system is given by. . Draw the Bode plot. Find the gain margin and phase margin of the system. | CO2 | 20 |
| **(OR)** | | | | |
| 8. |  | Draw the root locus diagram for the system which has open loop transfer function. Comment on the stability | CO3 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | The state variable model of the system is given below. Determine the controllability and observability of the system. | CO3 | 20 |