**20EI501**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **February,2023** | **Electronics and Instrumentation Engineering** | | |
| **Fifth Semester** | **Control Systems** | | |
| **Time:** Three Hours | | **Maximum: 7**0 Marks | |
| *Answer Question No. 1 Compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | (4X14=56 Marks) |

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| 1. | a) | What is the effect of feedback on a system’s performance? | CO1 | L2 | 1M |
|  | b) | List different classifications of control systems. | CO1 | L1 | 1M |
|  | c) | Distinguish between open-loop and closed-loop control systems. | CO1 | L4 | 1M |
|  | d) | List various block diagram representation rules. | CO1 | L1 | 1M |
|  | e) | Write the limitations of the Routh Hurwitz Criterion. | CO2 | L3 | 1M |
|  | f) | Define Peak overshoot. | CO2 | L1 | 1M |
|  | g) | Solve for the time response of the 1st order system due to unit step input. | CO2 | L3 | 1M |
|  | h) | Define gain cross-over frequency. | CO3 | L1 | 1M |
|  | i) | Define Phase Margin. | CO3 | L1 | 1M |
|  | j) | State Nyquist’s Stability Criterion. | CO3 | L1 | 1M |
|  | k) | Define Controllability. | CO4 | L1 | 1M |
|  | l) | Solve for the transfer function from the state model. | CO4 | L3 | 1M |
|  | m) | Compute eigenvalues of the matrix . | CO4 | L3 | 1M |
|  | n) | List the properties of the state transition matrix. | CO4 | L1 | 1M |
| **Unit -I** | | | | | |
| 2. | a) | Derive the transfer function of an AC servo motor. | CO1 | L3 | 7M |
|  | b) | Sketch the signal flow graph for the block diagram shown in the figure and there from obtain the transfer function of the system. | CO1 | L3 | 7M |
|  |  | **(OR)** |  |  |  |
| 3. | a) | Derive the transfer function of a field-controlled DC servo motor. | CO1 | L3 | 7M |
|  | b) | Solve for the transfer function of an electrical system shown in the figure. | CO1 | L3 | 7M |
|  |  | **Unit -II** |  |  |  |
| 4. | a) | Sketch and explain transient response specifications. Derive the expression for peak overshoot. | CO2 | L3 | 7M |
|  | b) | Using Rouths criterion, comment on the stability of a closed loop system whose characteristic equation is given by  Give a comment on the location of the roots. | CO2 | L4 | 7M |
|  |  | **P.T.O**    **20EI501**  **(OR)** | | | |
| 5. | a) | Derive the expression for the rise time of a second-order system due to unit step input for an under-damped system. | CO2 | L3 | 7M |
|  | b) | A unity feedback control system has an open loop transfer function . Determine the natural frequency, damping factor, and percentage overshoot. | CO2 | L3 | 7M |
|  |  | **Unit -III** | |  |  |
| 6. | a) | Explain the correlation between a second-order system's time domain and frequency domain specifications. | CO3 | L2 | 7M |
|  | b) | Sketch the Nyquist plot and discuss the stability of a closed-loop system whose open-loop transfer function is | CO3 | L3 | 7M |
|  |  | **(OR)** |  |  |  |
| 7. | a) | Write the rules for drawing the polar plots. | CO3 | L3 | 4M |
|  | b) | Sketch the Bode plot of a unity feedback system whose open loop transfer function . | CO3 | L3 | 10M |
|  |  | **Unit -IV** |  |  |  |
| 8. | a) | Define state transition matrix. Derive its equation. | CO4 | L3 | 7M |
|  | b) | Obtain the state model for the system whose transfer function is given by  . From the state model, explain again how to get the transfer function. | CO4 | L3 | 7M |
|  |  | **(OR)** |  |  |  |
| 9. | a) | List the merits of state variable analysis and formulation of the state model. | CO4 | L1 | 4M |
|  | b) | Determine the controllability and observability of the system described by the state model. | CO4 | L3 | 10M |

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