**20EC602**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **July/August, 2023** | **Electronics and Communication Engineering** | | |
| **Sixth Semester** | **Linear Control Systems** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | What is time-varying control system? | CO1 | L1 | 1 |
|  | b) | State Mason’s Gain formula. | CO1 | L2 | 1 |
|  | c) | What is the effect of positive feedback on stability? | CO1 | L1 | 1 |
|  | d) | What does the term ‘type’ of a system indicate? What is its significance? | CO2 | L1 | 1 |
|  | e) | Define Peak over shoot. | CO2 | L1 | 1 |
|  | f) | List only the dominant poles of the system with characteristic equation | CO2 | L4 | 1 |
|  | g) | Define BIBO stability. | CO3 | L1 | 1 |
|  | h) | Define Gain margin. | CO3 | L1 | 1 |
|  | i) | What is Nyquist contour? Give its limits. | CO4 | L2 | 1 |
|  | j) | What are the corner frequencies of the system, | CO4 | L2 | 1 |
|  | k) | If a system has 2 open loop poles and 4 open loop zeros, then the root locus will have how many branches. | CO1 | L2 | 1 |
|  | l) | Define ‘state vector’ of a system. | CO1 | L1 | 1 |
|  | m) | How to find stability from state model? | CO4 | L2 | 1 |
|  | n) | Define Observability of a system. | CO2 | L1 | 1 |
| **Unit-I** | | | | | |
| 2 | a) | Explain open loop control system with an example. | CO1 | L1 | 7M |
|  | b) | Find the transfer function for the given mechanical system shown. | CO1 | L4 | 7M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | Explain the block diagram reduction techniques. | CO1 | L1 | 7M |
|  | b) | Determine the transfer function of the block diagram show below using Signal flow graph approach.  download.png | CO1 | L4 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Determine an expression for the transient response of a second order system subjected to unit step input. | CO2 | L3 | 7M |
|  | b) | What are the limitations of Routh-Hurwitz Criterion? | CO2 | L1 | 7M |
| **P.T.O**  **20EC602**  **(OR)** | | | | | |
| 5 | a) | Derive expressions for time domain specifications Peak time and Rise time. | CO2 | L4 | 7M |
|  | b) | Determine range of values of K for the system to be stable, whose characteristic equation is given by . | CO2 | L3 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | A unit step response test conducted on a second order system yielded peak overshoot Mp=0.12 and peak time tp=0.2 sec. Obtain the corresponding frequency response specifications. | CO3 | L4 | 7M |
|  | b) | Sketch the Nyquist plot for the system and comment on stability. | CO3 | L4 | 7M |
| **(OR)** | | | | | |
| 7 | a) | How do we calculate the gain margin and phase margin from the polar plot. Explain. | CO3 | L2 | 7M |
|  | b) | Sketch the bode plot for the following system | CO3 | L3 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | Sketch the root locus for the system having OLTF, | CO4 | L3 | 7M |
|  | b) | Derive the transfer functions corresponding to the following state models.  And | CO4 | L4 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Explain the procedural steps to draw the root locus sketch. | CO4 | L2 | 7M |
|  | b) | Determine the controllability and Observability for the following system.  And | CO4 | L3 | 7M |

