**18EC502**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular) DEGREE EXAMINATION** | | | | | | | |
| **February, 2021** | | | **Electronics and Communication Engineering** | | | | |
| **Fifth Semester** | | | **Linear Control Systems** | | | | |
| **Time:** Three Hours | | | | **Maximum :** 50 Marks | | | |
| *Answer ALL Questions from PART-A.* | | | | | (1X10 = 10 Marks) | | |
| *Answer* ***ANY FOUR*** *questions from PART-B.* | | | | | (4X10=40 Marks) | | |
| **Part - A** | | | | | | | |
| 1. | Answer all questions | | | | | (1X10=10 Marks) | |
|  | a) | Define transfer function | | | | | CO1 |
|  | b) | What is linear and non-linear systems | | | | | CO1 |
|  | c) | What is the need for signal flow graph | | | | | CO1 |
|  | d) | what are static error constants | | | | | CO2 |
|  | e) | What is the use of RH criterion | | | | | CO2 |
|  | f) | What is Bode plot? | | | | | CO3 |
|  | g) | What is Polar plot? | | | | | CO3 |
|  | h) | What do you mean by root locus technique | | | | | CO4 |
|  | i) | What is state variable? | | | | | CO4 |
|  | j) | Write the state model of a system | | | | | CO4 |
| **Part - B** | | | | | | | |
| 2. | a) | Obtain the transfer function of the block diagram given below?. | | | | | 5M  CO1 |
|  | b) | Derive the transfer function for the given mechanical system. | | | | | 5M  CO1 |
|  | | | | | | | |
| 3. | a) | Find the overall transfer function of the system whose signal flow graph is shown in fig1 below. | | | | | 5M CO1 |
|  | b) | Write the differential equations governing the mechanical rotational system shown in fig 1. Obtain the transfer function of the system. | | | | | 5M  CO1 |
|  | | | | | | | |
| 4. | a) | Find (i) wd (ii) Tr (iii) Ts (iv) Mp (v) tp for a system having transfer function | | | | | 5M  CO2 |
|  | b) | Obtain the response of unity feedback system whose open loop transfer function is G(s) and when the input is unit step. | | | | | 5M  CO2 |
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| 5. | a) | Determine the step, ramp, parabolic error constants of the following feedback control system. | | | | | 5M  CO2 |
|  | b) | For the unity feedback system with , determine the range of K for the system to be stable. | | | | | 5M  CO2 |
|  | | | | | | | |
| 6. | a) | Define all the frequency domain specifications | | | | | 5M  CO3 |
|  | b) | A unity feedback control system has Draw the Bode plot and determine wgc and wpc from the plot | | | | | 5M  CO3 |
|  | | | | | | | |
| 7. | a) | A unity feedback control system has Draw the polar plot and determine the gain margin(GM) and phase margin(PM). | | | | | 5M  CO3 |
|  | b) | Write the procedure for investigating the stability using the Nyquist Criterion | | | | | 5M  CO3 |
|  | | | | | | | |
| 8. | a) | Explain various steps for constructing the Root Locus in case of a complex pole. | | | | | 5M  CO4 |
|  | b) | Sketch the root locus of the system whose open loop transfer function is.Find the value of K. | | | | | 5M  CO4 |
|  | | | | | | | |
| 9. | a) | Derive Transfer Function from State Model | | | | | 5M  CO4 |
|  | b) | The state and output equations of a SISO system are  Determine the controllability and observability. | | | | | 5M  CO4 |

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