

Code No: 155AR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, February - 2022

CONTROL SYSTEMS

(Common to ECE, EIE)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) With a neat closed loop block diagram, explain automobile driving system.  
b) Compare and contrast open loop and closed loop system. [8+7]
- 2.a) With a neat closed loop block diagram explain temperature control system.  
b) Explain the benefits of feedback system. [8+7]
3. Find stability of the following system with characteristic equation using Routh Hurwitz criterion [15]

$$2s^4 + s^3 + 3s^2 + 5s + 10 = 0$$

4. Elucidate Root Locus techniques with suitable example. [15]
5. Draw Nyquist plot for the system having following characteristics equation. [15]

$$Ks^3 + (2K + 1)s^2 + (2K + 5)s + 1 = 0$$

6. Draw Bode plot for the system with the following transfer function. [15]

$$L(s) = \frac{2500}{s(s+5)(s+50)}$$

7. The transfer function of a lag-lead compensator is given by

$$D(s) = \underbrace{\left[ \frac{\tau_1 s + 1}{\beta \tau_1 s + 1} \right]}_{\text{Lag Section}} \underbrace{\left[ \frac{\tau_2 s + 1}{\alpha \tau_2 s + 1} \right]}_{\text{Lead Section}}; \beta > 1, \alpha < 1, \tau_1, \tau_2 > 0$$

Give an op amp circuit that realizes this D(s). [15]

8. A system is given by the state equation

$$\dot{\mathbf{x}} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & 0 & -3 \end{bmatrix} \mathbf{x} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u; \mathbf{x}(0) = \mathbf{x}^0$$

Using Laplace transform technique, transform the state equations into a set of linear algebraic equations. [15]