



B.Tech II Year II Semester Supplementary Examinations, July 2022
CONTROL SYSTEMS

(ECE)

Maximum Marks: 70

Date: 26.07.2022

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Explain about various types of control systems.
- 2 State and explain Mason's gain formula.
- 3 Define 'type' and 'order' of the system.
- 4 Define the static error constants.
- 5 How R-H criterion is useful in plotting root locus?
- 6 What is Routh's stability criterion?
- 7 Draw the pole zero plot for lag-lead compensator
- 8 What are the advantages of Bode plot?
- 9 Define controllability.
- 10 State any four properties of State Transition Matrix.

Part-B

Answer All the following questions.

(10M X 5=50Marks)

11. Define the Impulse response of the system. Also find the impulse response of the system with open loop transfer function $G(s) = \frac{10}{s(s+3)}$. [10]

OR

12. Find the overall gain for the signal flow graph shown in figure 1. [10]

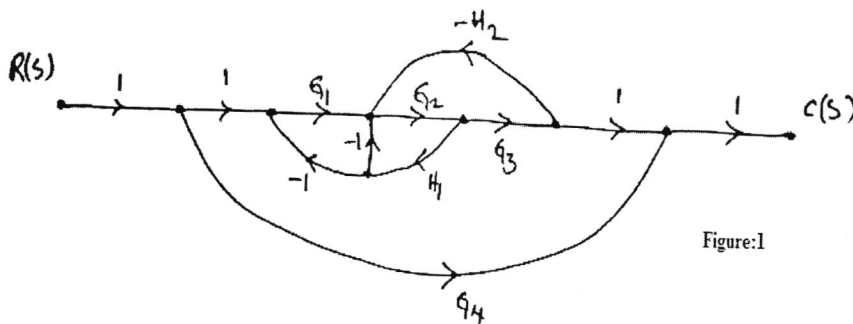


Figure:1

13. The overall transfer function unit step response of a closed loop system given by

$$\frac{C(S)}{R(S)} = \frac{36}{S^2 + 2S + 36}$$

Find the values of the static error constants. Also determine the steady state error for the input $r(t)=1+t+t^2$ [10]

OR

14. A. The open-loop transfer function of a unity feedback control system is given by

$G(s) = \frac{9}{s(s+3)}$. Find the natural frequency of response, damping ratio, damped frequency and time constant.

B. Write the equations for time domain specifications of a standard second order system with unit step input. [10]

15. Construct Routh's array and determine the stability of the system whose characteristic equation is $S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$. Determine the no of roots lying on the left half of S-Plane; Right half of the S-Plane and on Imaginary axis. [10]

OR

16. Draw the Bode magnitude and phase angle plots for the transfer function $G(s) = \frac{80}{s(s+2)(s+20)}$. Also find its gain margin and phase margin. [10]

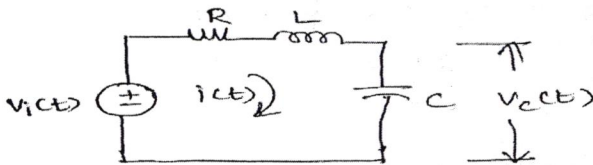
17. A. What is compensator? Explain about lead compensator.

B. What is PID controller and write its merits and demerits. [5+5]

OR

18. Draw the bode plot for the system having open loop transfer function $G(s) = \frac{50}{(s+1)(s+2)}$, $H(s)=1$. [10]

19. Obtain the state model for an RLC series Network. [10]



OR

20. For the system given below, obtain Zero input response and Zero state response for unit step input.

$$X(t) = \begin{bmatrix} 1 & 4 \\ -2 & -5 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t) \text{ and } X(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}. \quad [10]$$