Sr. No. 009402

August/September 2022
B.Tech(EIC) Re-Appear 4th Sem.
Control System-1 (EIC-210)

Time: 3 Hours **Max. Marks:60**

Instructions:
1. *It is compulsory to answer all the questions (2 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Semi-logarithmic graph paper is to be used for Bode Plot*

PART -A

Q1 (a) Write all the rules of block diagram reduction algebra. (2)

(b) State Initial value Theorem & how it is useful for a control system analysis? (2)

(c) Define Stability of a control system. What are the various measures for evaluating stability in time domain? (2)

(d) Compare open loop & closed loop control systems (2)

(e) Write the expression for a state transfer matrix while explaining each term used (2)

(f) what is the effect of adding a lag compensator in the control system? (2)

(g) Define Kp, Kv& Ka & how they are related to steady state error of a first order system? (2)

(h) Define various frequency domain specifications for a control system. (2)

(i) Define impulse response of a system. What is its significance? (2)

(j) Define Gain Margin & Phase Margin of a system. (2)

PART -B

Q2 (a) Find C(s)/R(s) using block diagram reduction technique. (5)

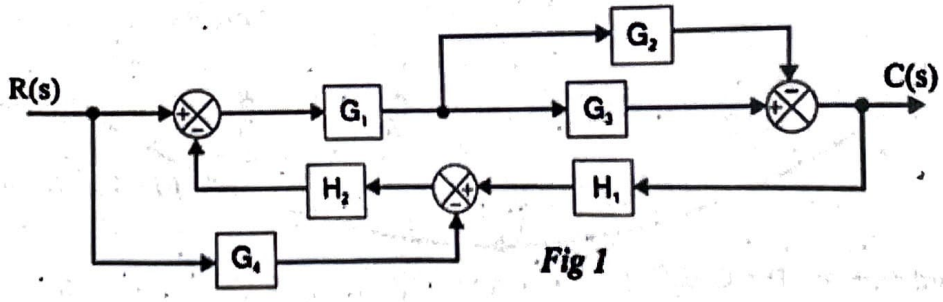

Fig 1

(b) Calculate the values of K for which the system having characteristic equation is stable: (5)

$$s^3 + 7s^2 + 28s + K = 0$$

Q3 (a) State &explain the rules of construction of root loci of G(s)H(s) (6)

(b) Consider the unity feedback closed loop system where the forward path t.f. is: (4)

$$G(s) = \frac{25}{s(s+5)}$$

Obtain the rise time,peak time,maximum overshoot and settling time when the system is subjected to a unit-step input.

Q4 Draw the Bode Plot of the transfer fn.: (10)

$$G(s)H(s) = \frac{80}{s(1+0.02s)(1+0.05s)}$$

Find out gain margin,phase margin& hence the stability of the system.

Q5 (a) Sketch the Polar plot of $G(s) = \frac{1}{(1+s)(1+2s)}$ (5)

(b) Find out the Steady State Error for r(t)=u(t), the transfer function for the system is given $G(s)H(s) = \frac{100}{(1+0.5s)(1+2s)}$ as: (5)

Q6 (a) Draw the pole zero configuration of a lag compensator on s- plane. Compare Lag & lead compensators. (5)

(b) Explain the terms: (i) Resonance Peak (ii) Relative Stability (iii) PI Control (5)

Q7 Write Short Notes on

(i) M & N Circles [5]

(ii) Nyquist Stability Criterion [5]

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