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SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | Total number of pages:[2]

B.Tech. || EE || 4th Sem

Linear Control System

Subject Code:BTEE-402

Paper ID:

Batch- 2011 onwards

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- All questions are compulsory
- Assume any missing data
- Additional instructions, if any
- Provide Semilog and graph papers.

PART A (10x 2marks)

Q. 1. Short-Answer Questions:

(a) Define open loop control system with suitable example.

(b) Define node, branch, path and loop in a signal flow graph.

(c) Define the damping ratio and explain how it affects the response of a system.

(d) Give advantages and disadvantages of block diagram reduction technique.

(e) What is the effect of lead lag compensator?

(f) Explain the servomechanism used in control system.

(g) Define phase margin and gain margin.

(h)Differentiate between over damped, critically damped and under damped systems?

(i) Give the time response of a control system if it has double roots at origin, one pair of roots on jw axis.

(j)How Routh-Hurwitz criterion is helpful in determining the stability of control system?

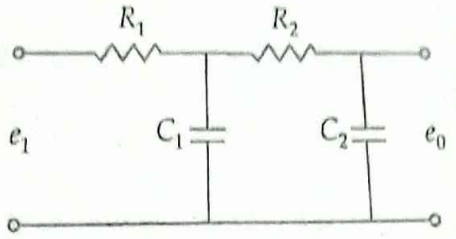
PART B (5×8marks)

Q. 2. Derive the time response of a second order system subject to unit impulse input. CO2

OR

Derive the time response of a second order system subject to unit step input and discuss all three cases and draw the location of roots of characteristics equation and time response. CO2

Q. 3. Explain the mason's gain formula? Draw the block diagram and signal flow graph and find out the transfer function of circuit as shown below. CO1



OR

Explain the thermal system, Pneumatic and hydraulic system in detail. CO1

Q. 4. Draw the bode plot for the transfer Function as given below and from the graph determine P.M and G.M. CO3

$$G(j\omega) = \frac{23.7(1 + j\omega)(1 + j0.2\omega)}{(j\omega)(1 + j3\omega)(1 + j0.5\omega)(1 + j0.1\omega)}$$

OR

Consider the unity feedback control system with the following open loop transfer function. $G(s) = \frac{K(s+1)}{s(s-1)}$. Sketch the root locus plot with 'k' as variable parameter and show that the loci of complex roots are prt of circle with (-1,0) as centre and radius= $\sqrt{2}$. CO3

Q. 5. What do you mean by compensation and Discuss various types of compensation techniques? Explain the design procedure for phase lead and phase lag compensations CO4

OR

Design a suitable lag compensation for a system whose transfer function is $G(s) = \frac{K}{s(s+2)(s+20)}$ to meet following specifications, K_v= 20 sec^{-1} and P.M $\geq$ 35^o. CO4

Q. 6. Explain Routh Hurwitz criteria? Determine the stability of system given below using Routh Hurwitz criteria. CO3

$$s^5 + 2s^4 + 2s^3 + 4s^2 + 11s + 10 = 0$$

OR

Explain root locus technique? Write down various rules used for the construction of Root locus? CO3