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10AE71

Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015
Control Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define open loop and closed loop control system. Explain with suitable examples. **(10 Marks)**

b. What are the requirements of an ideal control system? **(06 Marks)**

c. What is proportional controllers? Explain. **(04 Marks)**

2 a. Define transfer function. **(02 Marks)**

b. Explain the force voltage and force current analogies. **(10 Marks)**

c. Determine the transfer function $\frac{E_0(s)}{E_i(s)}$ for the electrical circuit. Refer Fig. Q2(c). **(08 Marks)**

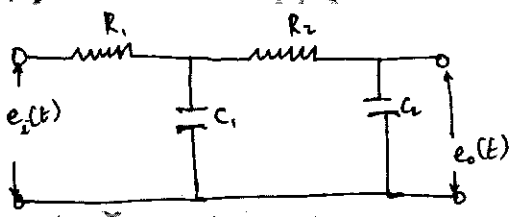

Fig. Q2(c)

3 a. Find $\frac{C}{R}$ by block diagram reduction technique. **(10 Marks)**

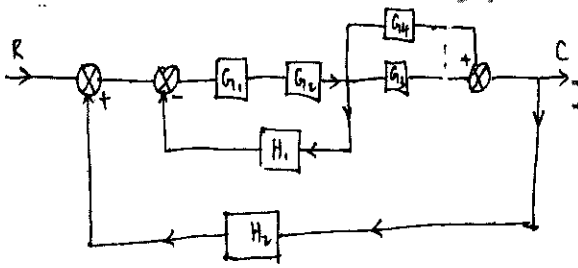

Fig. Q3(a)

b. Determine $\frac{C}{R}$ using masons gain formula for the system shown below. **(10 Marks)**

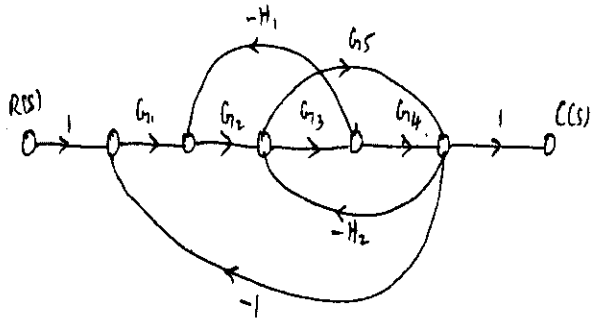

Fig. Q3(b)

4 a. Obtain an expression for time response of the first order system subjected to unit step input. **(08 Marks)**

b. Check the stability for $s^5 + 2s^4 + 2s^3 + 4s^2 + 11s + 6 = 0$ using R – H criterion. **(06 Marks)**

c. Find the range of 'k' for stability for the following system $s^3 + 6s^2 + 2s + k - ks = 0$. **(06 Marks)**

PART – B

5 a. For open loop transfer function of a system in $G(s)H(s) = \frac{s+2}{(s+1)(s-1)}$. Draw the Nyquist plot and ascertain its stability. **(14 Marks)**

b. What is polar plot? Sketch a typical polar plots and indicate phase cross over frequency and gain cross over frequency. **(06 Marks)**

6 Draw the Bode plot for the transfer functions :

$G(s) = \frac{k(1+0.2s)(1+0.025s)}{s^3(1+0.001s)(1+0.005s)}$. Show that is conditionally stable. Find the range of k for which the system is stable. **(20 Marks)**

7 Sketch root locus for $G(s)H(s) = \frac{k}{s(s+2)(s+6)}$. Find value of k for which system is stable and for which value of 'k' system is sustained oscillation. **(20 Marks)**

8 a. What is compensation? Draw the block diagram for series and feedback compensation and explain. **(10 Marks)**

b. Write short notes on :

i) Lead compensator

ii) Lag compensator. **(10 Marks)**

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