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06ME71

Seventh Semester B.E. Degree Examination, June/July 2013
Control Engineering

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define control system. Compare open loop and closed loop control system with 2 examples for each type. **(06 Marks)**

b. Explain and draw the block diagram of proportional integral controller. **(04 Marks)**

c. Explain the concept of feed back control system and the requirement of an ideal control system. **(10 Marks)**

2 a. Draw the equivalent mechanical system of the given system shown in Fig. Q2 (a). Hence write the set of equilibrium equations for it and obtain electrical analogous circuits using,
i) F-V analog
ii) F-I analog **(10 Marks)**

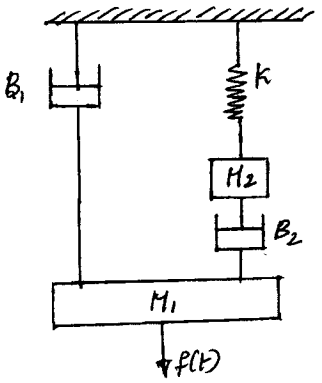

Fig. Q2 (a)

b. Derive the transfer function for an armature controlled dc motor. The field current is maintained constant during operation. Assume that the armature coil has back emf $E_b = K_b \frac{d\theta}{dt}$ and the coil current produces a torque T = KmI on the rotor, K_b and K_n are the back emf constant and motor torque constant respectively. **(10 Marks)**

3 a. Reduce the block diagram shown in Fig. Q3 (a) to its simplest possible form and find its closed loop transfer function. **(10 Marks)**

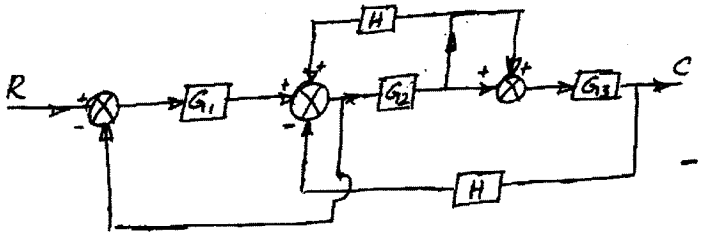

Fig. Q3 (a)

3 b. Using Mason's gain formula, find the gain of the following system shown in Fig. Q3 (b). **(10 Marks)**

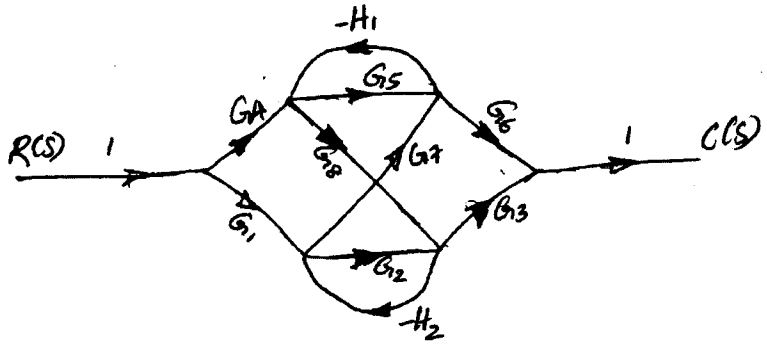

Fig. Q3 (b)

4 a. Explain Routh-Hurwitz criterion for stability of a control system and examine the stability of $s^4 + 2s^3 + 3s^2 + 8s + 2 = 0$ using the same. **(10 Marks)**

b. Define : i) time response ii) transient response iii) steady state response iv) steady state error. **(10 Marks)**

PART – B

5 Sketch the Nyquist plot for system with, $G(s)H(s) = \frac{(1+0.5s)}{s^2(1+0.1s)(1+0.02s)}$. Comment on the stability. **(20 Marks)**

6 Sketch the Bode plot and determine the gain cross over and phase-cross over frequencies, $C(s) = \frac{10}{s(1+0.5s)(1+0.1s)}$. **(20 Marks)**

7 Sketch the complete root locus of system having, $G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$ **(20 Marks)**

8 Write a note on with examples:

a. Lag compensator

b. Lead compensator. **(20 Marks)**

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