Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Control Engineering

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a.   Define a system, control, plant, controller and disturbance.   **(05 Marks)**
    b.   Give the requirements of an ideal control system.   **(05 Marks)**
    c.   Describe about the Proportional + Integral controller and proportional + Integral + Derivative controller with suitable diagrams.   **(10 Marks)**

2   a.   Write down the steps to solve problems on Analogous (F – V, F – I) systems.   **(08 Marks)**
    b.   Draw the equivalent mechanical system and analogous systems based on F-V, F-I methods for the given system.   **(12 Marks)**
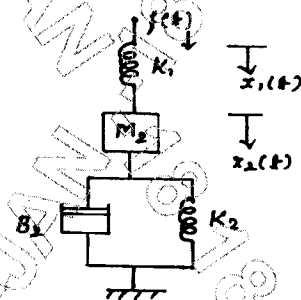

Fig.Q2(b)

3   a.   Determine the overall transfer function C(s)/R(s) for the system shown in the Fig.Q3(a).
                                                                                          (10 Marks)

Fig.Q3(a)

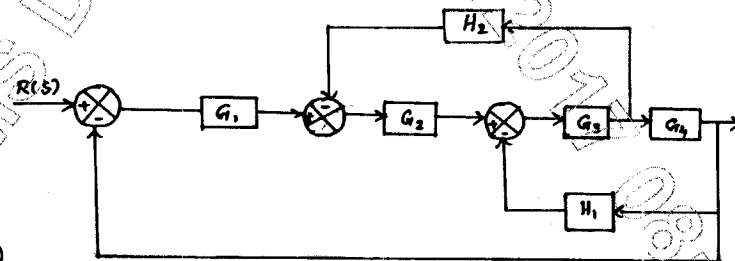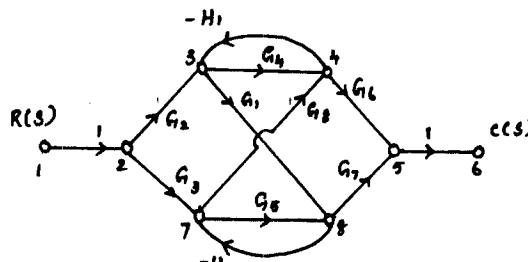   b.   Find the overall gain C(s)/R(s) for the signal flow graph shown in the following Fig.Q3(b).
                                                                                          (10 Marks)

Fig.Q3(b)

4 a. Check the stability of the given characteristic equation using Routh's method.
$$s^6 + 4s^5 + 3s^4 - 16s^2 - 64s - 48 = 0$$ **(10 Marks)**

   b. Derive the expression for unit step response of underdamped second order system. **(10 Marks)**

PART – B

5 a. Sketch the polar plot and determine the gain margin and phase margin for the open loop transfer function is given by $G(s) = \dfrac{1}{s(s+1)(1+2s)}$. **(12 Marks)**

   b. Write down the steps to solve problems by Nyquist criterion. **(08 Marks)**

6 Sketch Bode plot for the following transfer function and determine the system gain K for the gain cross over frequency to be 5 rad/sec.
$$G(s) = \frac{Ks^2}{(1+0.2s)(1+0.02s)}$$ **(20 Marks)**

7 a. Describe the steps for constructing the root locus. **(08 Marks)**

   b. Sketch the root locus of system having, $G(s)H(s) = \dfrac{K}{s(s+3)(s+5)}$. **(12 Marks)**

8 a. What is compensation? Describe about the lead compensator and its steps for designing. **(10 Marks)**

   b. Give explanation about lag-lead compensation with relevant diagrams. **(10 Marks)**

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