Total No. of printed pages = 3

CAI-501/CS/5th Sem/2013/M

CONTROL SYSTEMS

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) What are the standard test signals ? Explain briefly. 7

   (b) Derive the mathematical model for rotational system. 7

2. (a) Derive the transfer function of field control DC motor. 7

   (b) The closed loop transfer function of a second order system is given by $\frac{200}{s^2+20s+200}$. Determine the damping ratio, natural frequency of oscillation and what is the type of damping in the system. 5

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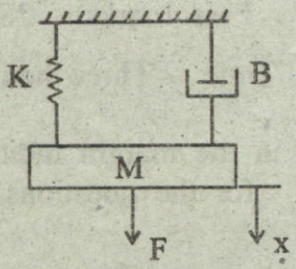
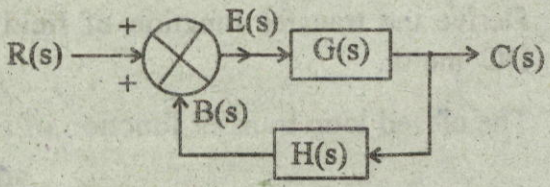
(c) A second order system has a damping ratio of 0.6 and natural frequency of oscillation is 10 rad/sec. Determine the damped frequency of oscillation. 2

3. (a) Find the transfer function for given mechanical system 7



(b) What is automatic control system ? Explain with neat block diagram and its example. 7

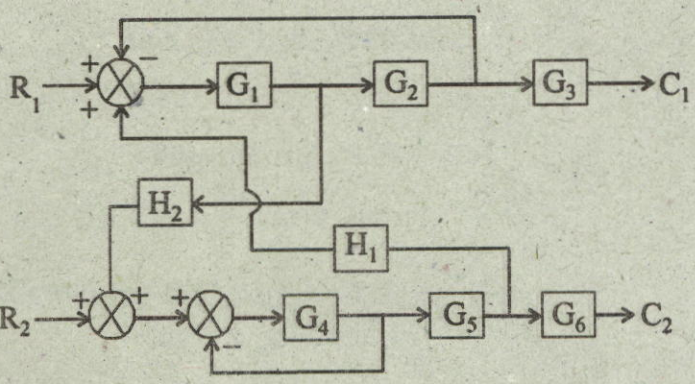
4. (a) Derive the transfer function for the closed loop system given below : 5



(b) What is steady state error and static error constants ? 7

(c) What is Mason's Gain Formula ? 2

5. For the system represented by the block diagram shown in the below figure. Determine C_1/R_1 and C_2/R_1 14



6. (a) Using Routh criterian, determine the stability of the system represented by the characteristic equation $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$. Comment on the location of the roots of characteristic equation. 7

(b) Write the rules for construction of root locus 7

7. (a) What is frequency response and frequency domain specifications ? 7

(b) What is time response and time response specifications ? 7