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No. of Printed Pages—3 **ME–605**

B. TECH.

SIXTH SEMESTER EXAMINATION, 2003-2004

AUTOMATIC CONTROLS

Time : 2 Hours *Total Marks : 50*

Note : Attempt **ALL** questions.

1. Attempt any *FOUR* of the following :— **(3.5×4)**

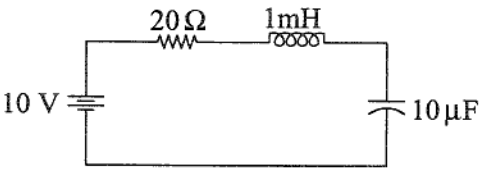
(a) List out merits and demerit of closed loop control system.

(b) Discuss two most essential features of a closed loop control system with the help of a suitable example.

(c) Determine the expression for the time function f(t) from the S-domain function.

$$F(S) = \frac{S+3}{S^2(S+1)}$$

(d) A resistor, a capacitor and an inductor are connected in series. A DC voltage of 10 V is applied through a battery with low impedance. Assuming all initial conditions as zero, determine a general expression for current :—



(e) Simplify the given block diagram :—

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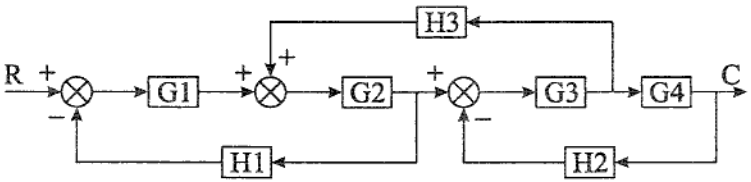
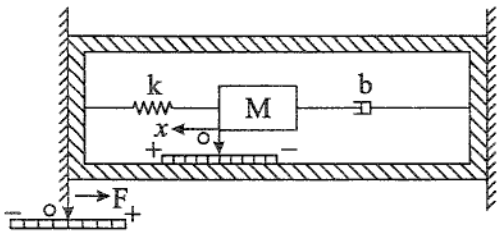
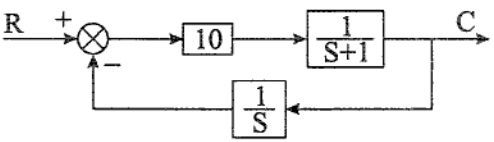


(f) Find out the transfer function of the given mechanical system :—



2. Attempt any *FOUR* of the following :— (3×4)

(a) Determine the response of the given system to a unit step input :—



(b) Consider the unity feedback closed loop system, where

$$G(S) = \frac{25}{S(S+5)}$$

Obtain rise time and peak time, when the system is subjected to a unit step input.

(c) Briefly discuss about the settling time of a second order system under a unit step input.

(d) What is a two-position controller ? How does the neutral zone affect its performance ?

(e) Define proportional band of a controller.

What will you infer if this band is given as 5% ?

(f) Find out the transfer function of a PID controller.

3. Attempt any *TWO* of the following :— (6×2)

(a) Find the stability of the system given using Routh's criterion :—

$$S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$$

(b) Discuss the functioning of a pneumatic force distance type proportional controller.

(c) With a neat sketch, discuss about the generation of integration action in a hydraulic linear actuator.

4. Attempt any *TWO* of the following :— (6×2)

(a) For the given open loop transfer function, calculate —

(i) the angle of departure,

(ii) intersection with imaginary axis, using root locus technique.

$$G(S)H(S) = \frac{K}{S(S+3)(S^2+2S+2)}$$

(b) Sketch the polar plot of the following transfer function as ω varies from $-\infty$ to $+\infty$:—

$$G(S) = \frac{10\,(S+1)}{(S+10)}$$

(c) Draw the Bode plot for first order factors —

$$(1+jwt) \text{ and } \left(\frac{1}{1+jwt}\right)$$