No. of Printed Pages : 4

**BIEL-020**

# B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

011121

## Term-End Examination

## December, 2013

## BIEL-020 : CONTROL ENGINEERING

*Time : 3 hours* *Maximum Marks : 70*

***Note :*** *(i) Attempt **any seven** questions.*
*(ii) All questions carry **equal** marks.*
*(iii) Use of scientific calculator is **permissible**.*

**1.** (a) What are the limitations of open loop systems over closed loop systems ? List the advantages of closed - loop system over open loop systems. 5

(b) Obtain the overall transfer function of the block diagram shown in Fig.1 by block diagram reduction technique. 5

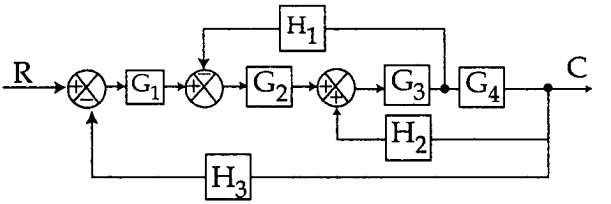


Fig. 1

2. Write the differential equations for the mechanical system shown in Fig.2. Also draw the analogous electrical circuit based on force-current analogy. **10**

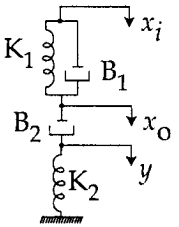

Fig.2

3. The open loop transfer function of a unity feed back system is given by **10**

$$G(s) = \frac{K}{s(1 + Ts)}$$

where K and T are positive constants. By what factor should the amplifier gain K be reduced so that the peak overshoot of unit step response of the system is reduced from 75% to 25%.

4. A unity feed back system is characterised by the open loop transfer function **10**

$$G(s) = \frac{1}{s(0.5s + 1)(0.2s+1)}$$

Determine the steady-state errors for unit-step unit-ramp and unit acceleration inputs.

5. The open loop transfer function for a unity feed back system is given by **10**

$$G(s) = \frac{K}{s(1+T_1 s)(1+T_2 s)}$$

Find the necessary conditions for the system to be stable using Routh's criterion of stability.

6. Sketch the root locus of unity feed back system having **10**

$$G(s) = \frac{K}{s(s+2)(s+4)}$$

where K is varied from 0 to $\infty$. Hence obtain the value of K for which the system is unstable.

7. Find the transfer function of a system whose Bode plot is shown in fig. 3 **10**

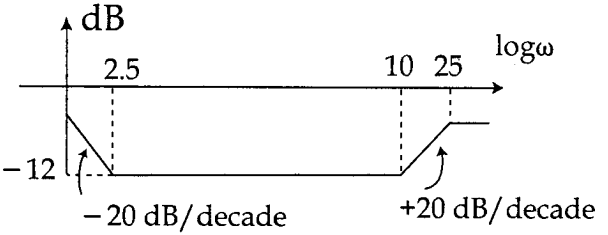


Fig. 3

8. What is the procedure for the design of a lag-lead compensator ? **10**

9. A system is described by the following differential equations : 10

$$\frac{d^3x}{dt^3} + 3\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 4x$$

$$= u_1(t) + 3u_2(t) + 4u_3(t)$$

The outputs are

$$y_1 = 4\frac{dx}{dt} + 3u_1;\ y_2 = \frac{d^2x}{dt^2} + 4u_2 + u_3$$

Obtain the state space representation of the system.

10. Write short notes on **any two** of the following : **2x5=10**

(a) Nyquist-Stability Criterion

(b) Fuzzy Logic Control

(c) Tuning of PID Controllers