No. of Printed Pages : 4

BIEL-020

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

00334

Term-End Examination

June, 2014

BIEL-020 : CONTROL ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of calculator is permissible.*

1. (a) Find the transfer function of the signal graph shown in Figure 1. 5

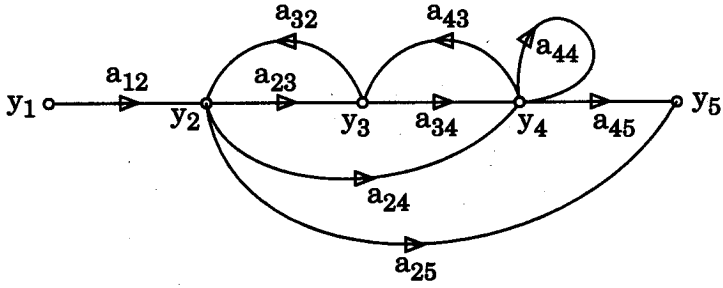

Figure 1

(b) What is the effect of feedback on the system gain and system sensitivity ? Prove it mathematically. 5

2. A mechanical vibratory system is shown in Figure 2(a). When a force of 8·9 N is applied to the system, the mass oscillates as shown in Figure 2(b). Find the values of M, B and K. *10*

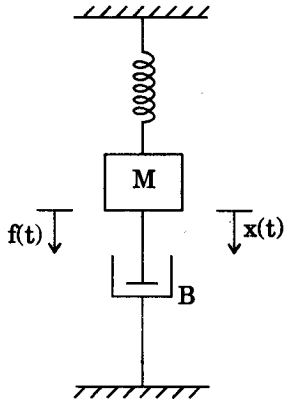

Figure 2(a)

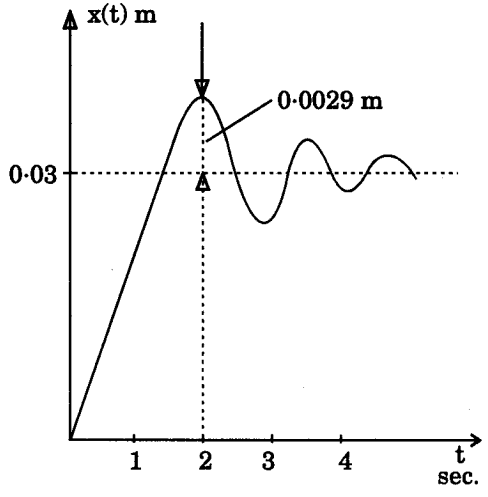

Figure 2(b)

3. (a) What is meant by PID control ? What are the advantages of PID controller ? *4*

(b) The forward path transfer function of a unity feedback control is given by

$$G(s) = \frac{2}{s(s+3)}$$

Obtain the expression for unit step response of the system. *6*

4. The characteristic equation of a feedback control system is $s^4 + 20s^3 + 15s^2 + 2s + K = 0$.

   (a) Determine the range of K for the system to be stable. *4*

   (b) Can the system be marginally stable ? If so, find the required value of K and the frequency of sustained oscillation. *6*

5. Draw the Bode plot for the transfer function

$$G(s) = \frac{36\,(1 + 0{\cdot}2\,s)}{s^2(1 + 0{\cdot}05\,s)\,(1 + 0{\cdot}01\,s)}$$

   From the Bode plot, determine

   (a) Phase Crossover frequency

   (b) Gain Crossover frequency

   (c) Gain Margin

   (d) Phase Margin *10*

6. Sketch the polar plot of the function

$$G(s) = \frac{1}{s^2(1 + sT)}$$ *10*

7. State and explain the Nyquist Stability Criterion. What is the effect of addition of a pole at $s = 0$ to $G(s)H(s)$ on the Nyquist plot ? *10*

8. What is lag-compensator ? Obtain the transfer function of lag-compensator and draw the pole-zero plot. *10*

9. Obtain the state variable representation of a field-controlled dc motor shown in Figure 3. *10*

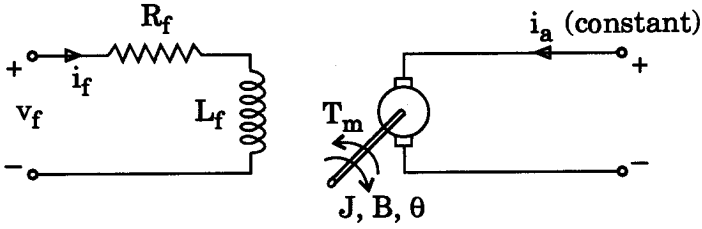

Figure 3

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Neural Network

(b) Routh-Hurwitz Stability Criterion

(c) M and N Circle