No. of Printed Pages : 4

BIEE-021

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00205

December, 2014

BIEE-021 : CONTROL SYSTEM

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use graph wherever required. Semi log paper will be provided. Use of scientific calculator is allowed.*

1. (a) Determine the transfer function $[e_0(s)/e_i(s)]$ of the Figure 1 given below. *8*

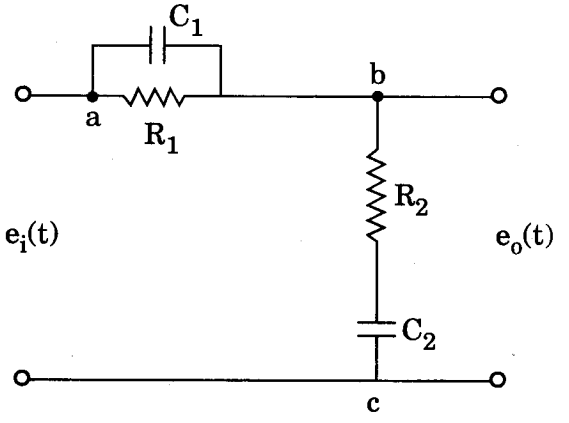

Figure 1

(b) Distinguish between open loop system and closed loop systems. Give one example of each. *6*

2. (a) Write notes on feedback system and explain the effect of feedback on *6*

(i) Overall gain

(ii) Stability

(iii) Sensitivity

(b) Obtain overall transfer function for the system shown in Figure 2, using Block diagram reduction technique. *8*

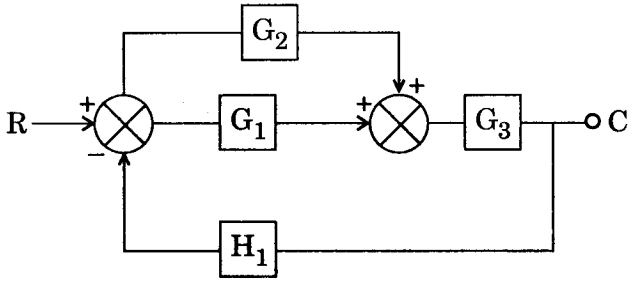

Figure 2

3. Consider the Signal Flow Graph (SFG) shown in Figure 3 and determine the gain of SFG by Mason's Gain formula. *14*

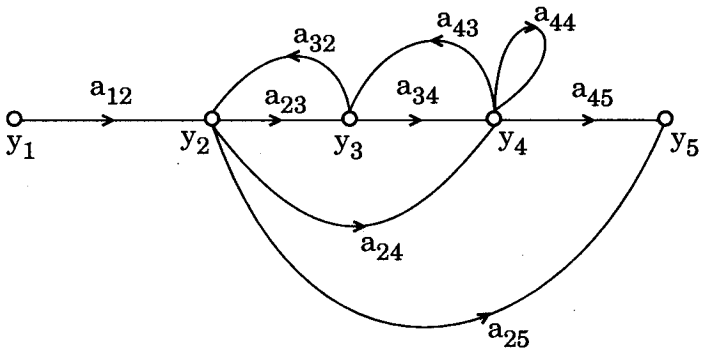

Figure 3

4. Certain measurements were conducted on servo mechanism which show the system response as,

$$c(t) = 1 + 0{\cdot}2\, e^{-60t} - 1{\cdot}2\, e^{-10t} \qquad 14$$

When subject to unit step input, determine

(i) Expression for closed loop transfer function.

(ii) The undamped natural frequency and damping ratio of the system.

5. (a) Define the following : *4×2=8*

(i) Rise time

(ii) Peak time

(iii) Settling time

(iv) Maximum overshoot

(b) Write the stepwise procedure for plotting the root locus for a given open loop transfer function. *6*

6. The open loop transfer function of unity feedback system is $\frac{K}{s(1 + 0{\cdot}4s)(1 + 0{\cdot}25s)}$. Find the restriction of K, so that the closed loop system is absolutely stable. *14*

7. Sketch the Bode plot for a unity feedback system characterized by the loop transfer function $G(s) = \frac{K(1 + 0{\cdot}2s)(1 + 0{\cdot}025s))}{s^3(1 + 0{\cdot}001s)(1 + 0{\cdot}005s)}$.

Show that the system is conditionally stable. Find the range of values of K for which the system is stable. *14*

8. Write short notes on the following : $4 \times 3\frac{1}{2} = 14$

(i) Lag-Lead compensator

(ii) Concept of state variable and state model

(iii) A.C. servo motor

(iv) A.C. tacho generator