BIEE-021

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

Term-End Examination

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December, 2016

BIEE-021 : CONTROL SYSTEMS

Time : 3 hours   *Maximum Marks : 70*

Note : Attempt any seven questions. Each question carries 10 marks. Use of scientific calculator is permitted.

1. Explain the closed-loop control system, with a suitable block diagram. Also explain the automatic control system. How is an automatic control system different from a closed-loop control system ? *10*

2. An R-C network is shown in Figure 1. Find its transfer function. *10*
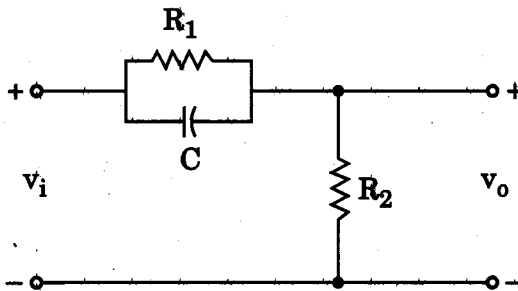
Figure 1

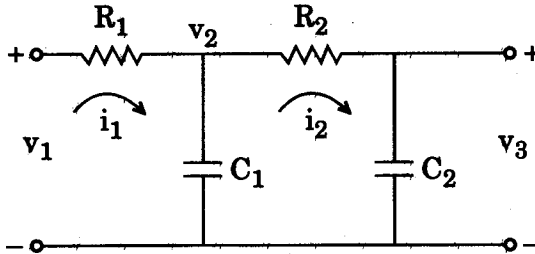3. Draw the signal flow graph for the circuit shown in Figure 2. Hence derive its transfer function V_3 / V_1. 　　　　*10*

Figure 2

4. Define feedback for a control system. What are the effects of feedback in a control system ? Explain in detail. 　　　*10*

5. Explain the operation of Synchro having a closed-loop control system working as AC position control system. 　　　*10*

6. Draw and explain the following test signals used for time response analysis of control systems : 　　*10*

   (a) Step signal

   (b) Impulse signal

7. Determine the Hurwitz conditions for stability of the fourth order characteristics equation

   $$a_4 s^4 + a_3 s^3 + a_2 s^2 + a_1 s + a_0 = 0.$$

   Assume a_4 to be positive. 　　　*10*

8. Determine the gain margin and phase margin of a unity feedback system having an open-loop transfer function

$$G(j\omega) = \frac{10}{j\omega(j\,0.1\,\omega + 1)\,(j\,0.05\,\omega + 1)}$$

by use of Bode plot.   *10*

9. Write short notes on any *two* of the following :

    2×5=10

    (a) Root locus of conditional stable system

    (b) Derivation of state model from transfer functions

    (c) PID Controllers

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