No. of Printed Pages : 4

BIEL-020

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

00313 **Term-End Examination**

December, 2018

BIEL-020 : CONTROL ENGINEERING

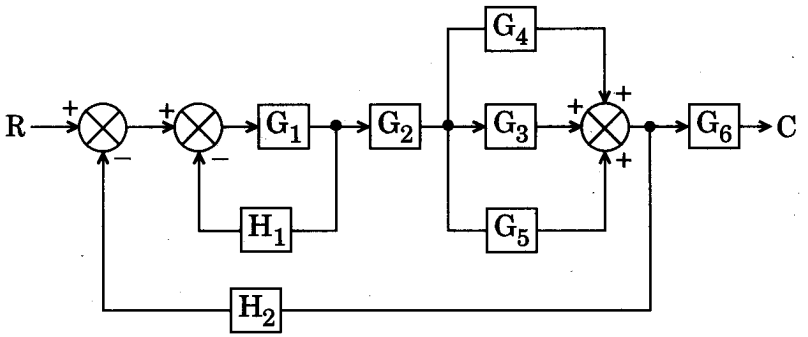
Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permissible. Use of graph paper and semi-log sheet is allowed.*

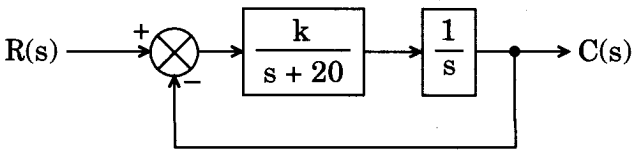
1. Draw the block diagram of a closed loop control system and indicate the following on it :
   (i) Plant
   (ii) Command input
   (iii) Controlled output
   (iv) Actuating signal
   (v) Feedback element and Control element

   Also mention the important features of closed loop control system. *10*

2. Obtain the signal flow graph representation for a system whose block diagram is given below and using Mason's gain formula, determine the ratio $\frac{C}{R}$: *10*



3. The block diagram of an electronic pacemaker is given below. Determine the steady state error for unit ramp input when k = 400. Also determine the value of k for which the steady state error to a unit ramp will be 0·02. *10*



4. A feedback system is described by the following transfer function :

$$G(s) = \frac{16}{s^2 + 4s + 16}, \quad H(s) = ks$$

The damping factor of the system is 0·8. Determine the overshoot of the system and the value of k. *10*

5. A unity feedback control system is characterized by open loop transfer function

$$G(s) = \frac{k(s + 13)}{s(s + 3)(s + 7)}.$$

Using Routh's criterion, calculate the range of values of k for the system to be stable. *10*

6. Explain clearly, by taking suitable example, the Angle of Departure and Angle of Arrival of the Root Loci. *10*

7. What are the various types of compensation schemes used in control systems ? Explain the concept of cascade lead compensation of control system with the help of an example. *10*

8. Clearly explain all the design procedure of phase lag compensation network. *10*

9. Discuss the advantages of state-space representation of systems. Point out the significance of state transition matrix in solving equations. *10*

10. A single-input single-output system is given as :

$$\dot{x}(t) = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -3 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 & 2 \end{bmatrix} x(t)$$

Test for controllability and observability. *10*