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BIEL-020

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

Term-End Examination

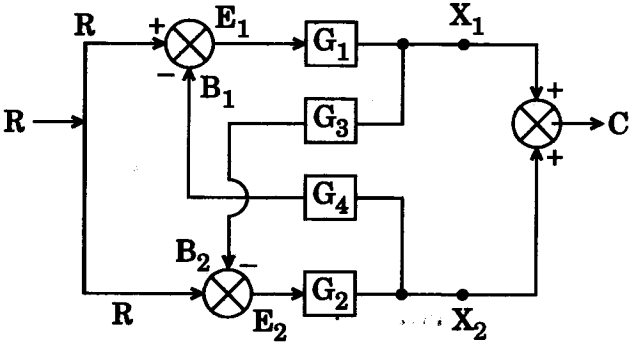
□□3□□ **December, 2017**

BIEL-020 : CONTROL ENGINEERING

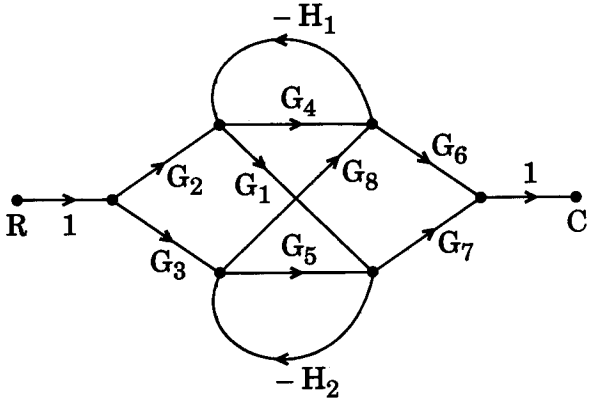
Time : 3 hours *Maximum Marks : 70*

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.*

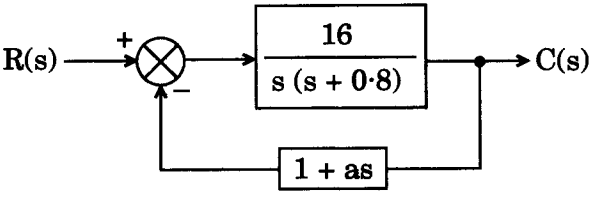
1. Determine the ratio C/R. *10*



2. Obtain the transfer function C/R from the signal flow graph as shown below : *10*



3. Consider the system as shown below. Determine the value of 'a' such that the damping ratio is 0·5. Also obtain the values of rise time and maximum overshoot M_p in its step response. *10*



4. The forward path transfer function of a unity feedback control system is given by

$$G(s) = \frac{5\,(s^2 + 2s + 100)}{s^2\,(s + 5)\,(s^2 + 3s + 10)}$$

Determine the step, ramp and parabolic error coefficients. Also determine the type of the system. *10*

5. Sketch the polar plot for

$$G(s) = \frac{20}{s\,(s+1)\,(s+2)}.$$ *10*

6. Define the following terms in reference to Bode plots for a given transfer function : *10*

   (a) Phase Crossover Frequency

   (b) Gain Crossover Frequency

   (c) Phase Margin

   (d) Gain Margin

7. A feedback system has an open loop transfer function

$$G(s)\,H(s) = \frac{Kc^{-s}}{s\,(s^2+5s+9)}.$$

   Determine by the use of Routh criterion, the maximum value of K for the closed loop system to be stable. *10*

8. Explain all the rules required for the construction of Root Locii. *10*

9. A system characterised by the transfer function

$$\frac{Y(s)}{U(s)} = \frac{2}{s^3+6s^2+11s+6}.$$

   Find the state and output equation in matrix form and also test the controllability and observability of the system. *10*

10. Explain what do you understand by Cascade-Lead compensation of a linear control system ? Give the transfer function of a typical lead compensator and explain its basic characteristics in reference to Bode plot. *10*