Total No. of Questions : 8]   *[Total No. of Printed Pages : 3*

Roll No ....

EE/EX-4004-CBGS

B.E. IV Semester

Examination, June 2020

Choice Based Grading System (CBGS)
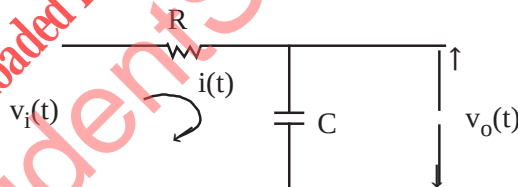
Control Systems

Time : Three Hours

Maximum Marks : 70

Note: i)   Attempt any five questions.

     ii)   All questions carry equal marks.

1. a)   What is a control system? What are open loop and closed loop control system? Enlist some application in control systems.

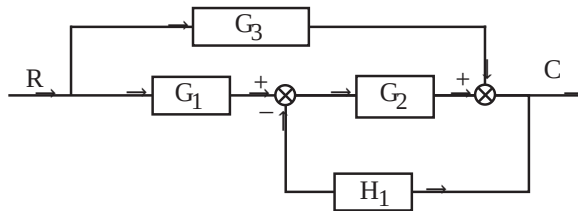   b)   Find the transfer function for the following network.

2. a)   What is a mason gain formula? Explain each component of the formula and mention its advantages over block diagram reduction techniques.

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b) Determine the overall transfer function relating C and R for the block diagram shown in fig. below.

3. a) Explain time response of first order system to unit and unit ramp input also. Find the steady state error response for both.

   b) What is effect of addition of poles and zeros to closed loop system?

4. a) Define steady state error. Also derive the expression for steady state error for closed loop unity feedback.

   b) The overall transfer function of a unity feedback control system is given by $\dfrac{C(s)}{R(s)} = \dfrac{10}{s^2 + 6s + 10}$

   Find Kp, Kv and Ka

5. State the Bode plot for the system whose open loop transfer function is given by

$$G(s)H(s) = \frac{20}{s(s+1)(s+4)}$$

Find:

   i) Phase margin

   ii) Gain margin and then comment on stability.

6. Construct Routh array and determine the stability of the system whose characteristic equation is

$$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$$

Also determine the number of roots lying on the right half side *s* plane, left hand side of *s* plane and on imaginary axis.

7. a) What do you understand by lead-lag compensation?

   b) What is proportional plus derivative control?

8. a) What are necessary condition for stability of control system?

   b) Write a short note on state variables.

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