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

Roll No.....

EC-502 (GS)

B.E. V Semester

Examination, December 2017

Grading System (GS)

Control Systems

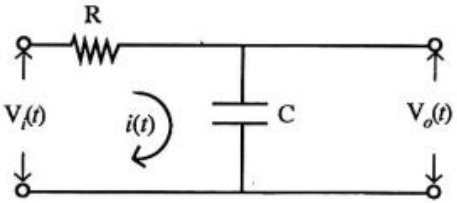
Time : Three Hours

Maximum Marks : 70

Note: i) Total number of questions eight.
ii) Answer any five questions.
iii) All questions carry equal marks.

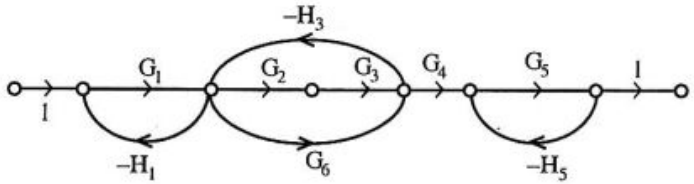
1. a) Briefly explain the classification of control system. 8
   b) Explain the following terms with reference to block diagram representation. 6
      i) Block diagram
      ii) Output
      iii) Summing point
      iv) Take-off point
      v) Forward path
      vi) Feedback path

2. a) Find the transfer function for the following electrical network. 7



292

   b) Using Mason's gain formula, find the gain of the following system. 7



3. a) For the system with negative feedback, discuss the effect of feedback on the following: 6
      i) Disturbance
      ii) System parameter variation
      iii) System time constant
      Obtain mathematical expression in each case.
   b) Discuss the effect of adding a pole and a zero on root locii. 8

4. a) Write down the steps of drawing the root locus of any system. How the stability can be judged by the root locus. 7
   b) Determine the stability of a system having following characteristics equation using Routh-Hurwitz criterion: 7

$$s^5 + s^4 + 2s^3 + 2s^2 + 11s + 10 = 0$$

5. a) Discuss advantages of frequency response analysis over the root locus technique. 7
   b) Explain the significance of phase margin and gain margin in determining the relative stability of closed loop system. 7

293

6. a) Why compensation is useful in control system? Explain there types depending upon the location of compensating network. 6

   b) Describe construction and design concept of phase load compensation. 8

7. a) Describe the derivative feedback control system. Also mention the parameters which are affected by derivative feedback control system. 7

   b) Explain controllability of the system. Determine the controllability of the system described by 7

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ -2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

8. Write short notes on any two: 14

   a) Time response of a second order system.

   b) Integral and PID control

   c) Relation between state equation and transfer function

******