2014

M.Sc.

3rd Semester Examination

ELECTRONICS

PAPER—ELC-302

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Control System and Instrumentation)

Answer *Q. No. 1* and any *three* questions from the rest.

1. Answer *all* questions :   2×5

    (a) What are the advantages of feedback network in a control system ?

    (b) Find the Z-transform of e^{at} using basic principle.

    (c) What is PID controller ?

    (d) What are the advantages of digital instrument over analog instrument ?

    (e) Define the term 'harmonic distortion'.

2. (a) Find C/R of the following SFG using Mason's gain formula :
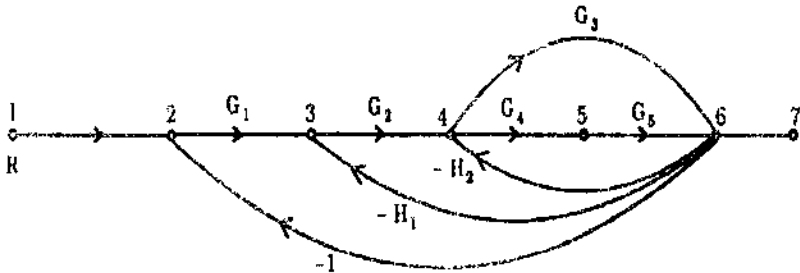
(b) For the characteristic equation of feedback control system given, determine the range of K for stability by using Routh Hurwitz criterion :

$$S^4 + 25S^3 + 15S^2 + 20S + K = 0. \qquad 5+5$$

3. (a) The open loop transfer function of a unity feedback system is given by :

$$G(S) = \frac{K}{S(1+ST)}$$

where 'K' and 'T' are positive constants. By what factor should the amplifier gain be reduced so that the peak overshoot of unit step response of the system is reduced from 75% to 25%.

(b) Write short notes on tachometer. 7+3

4. (a) The open loop transfer function of a unity feedback system is given by :

$$G(S)H(S) = \frac{5}{S(S+1)(S+2)}$$

Draw the Nyanist plot & find out whether the system is stable or not.

(b) For a unity feedback control system the forward path transfer function is given by :
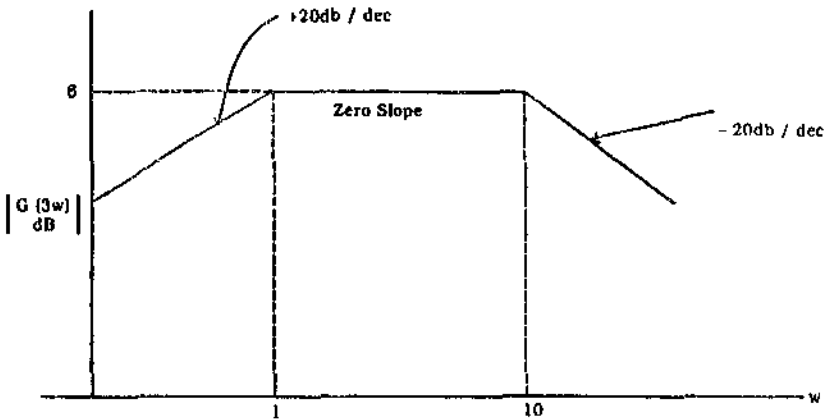
$$G(S) = \frac{20}{S(S+2)(S^2+2S+20)}$$

Determine the steady state errors of the system when the input are 5t.   7+3

5. (a) Sketch the root locus plot for the system having open loop T.F. function is given by :

$$G(S)H(S) = \frac{K}{S(S+4)(S^2+4S+13)}$$

(b) Find the transfer function of the given Bode diagram :   7+3

6. (a) Describe the circuit of a 3 amplifier configuration of an Instrumentation amplifier. This amplifier is divided into two stages. Describe how the first stage offers a very high impedance to both the input signals and the gain to be set and the second stage acts as a difference amplifier.

   (b) State how the disadvantages of P, I and D control actions are overcome in composite mode operations.

   (c) How does the range changing circuit work for a DVM ?

5+3+2

[Internal Assessment — 10]