2016

M.Sc.

3rd Semester Examination

ELECTRONICS

PAPER—ELC-302

Full Marks : 50

Time : 2 Hours

The figures in the margin indicate full marks.

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

Illustrate the answers wherever necessary.
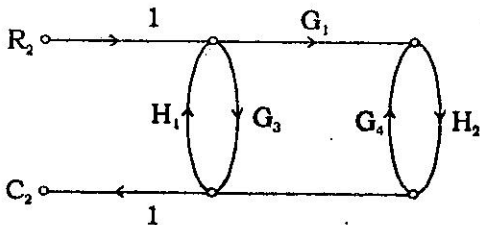
(Control System and Instrumentation)

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

1. (a) What is the difference between open loop control system & closed loop control system ?

   (b) Find the inverse laplace transform of the following function :

   $$F(S) = \frac{S+6}{S(S^2+4S+3)}$$

(c) Find the overall transfer function using Mason's gain formula.

(d) What is the difference between dual beam CRO & dual trace CRO ?

(e) What is the application of spectrum analyser ? 2×5

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

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

By what factor the amplifier gain k should be multipled so that the damping ratio is increased from 0.3 to 0.9 ?

(b) For a unity feedback control system, the forward path transfer function is given by

$$G(S) = \frac{20}{S(S + 2)\left(S^2 + 2S + 20\right)}$$

(Continued)

Determine the steady state error of the system. When the inputs are

(i) 5 (ii) 5t.   5+5

3. (a) Determine the stability of the system with closed loop transfer function using Routh-Stability criterion.

$$\frac{C(S)}{R(S)} = \frac{10}{S^6 + 2S^5 + 2S^4 + 3S^3 + 5S^2 + 6S + 1}$$

(b) A unity feedback control system has an open loop transfer function

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

Sketch the root locus plot of the system by determining the following :

(a) Centroid, number and angle of asymptoles.

(b) Angle of departure of root locii from the poles.

(c) Breakaway point if any.

(d) The value of k and the frequency at which the root locii cross jw assls.   4+6

4. (a) Define Phase margin & Gain margin.

(b) Draw the Bodeplot of the open loop transfer function

$$G(S) = \frac{200(S + 10)}{S(S + 5)(S + 20)}$$

(c) Write short notes on Instrumentation amplifier.

2+5+3

5. (a) Using operational amplifier realise a PID. Controller with separated P, I and D blocks. How the proportional, integral and derivative gainscan be adjusted ?

(b) Draw and explain the circuit of a digital frequency meter.

5+5

6. (a) What is meant by automatic control system ? Draw the block diagram of an automatic control system and explain the function of each unit of the system.

(b) How much voltage is required across two deflection plates separated by 1 cm to deflect an electron beam 1° if the effective length of the deflection plates is 2 cm and the accelerating potential is 1000V ?   5+5

(Internal Assessment : 10 Marks)

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