2015

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. (a) Show the use of feedback in control system reduces the sensitivity of the system to parameter variation.

(b) What is called an ‘Offset’ in a proportional controller? How is offset eliminated with the help of integral control mode?

(c) Calculate the dynamic range of a spectrum analyzer with a third order intercept point of 20 dBm and a noise level of 100 dBm.

(Turn Over)
(d) How damping ratio affects the tune response of a second order system?

(c) What are the necessary conditions to have all the roots of a characteristic equation in the left half of S-plane?

2. (a) The output of a system is given by

\[ C(t) = 2 + 0.2 \cdot e^{-60t} - 1.2 \cdot e^{-10t} \]

when subjected to a unit step unit:

(i) Obtain the expression for the closed loop transfer function.

(ii) Determine the undamped natural frequency & damping ratio of the system.

(b) The open loop transfer function of unity feedback system is given by

\[ G(S) = \frac{50}{(1+0.1S)(S+10)} \]

Determine the static error co-efficients \( K_p, K_v \) and \( K_a \).

3. (a) Sketch the Bode plot of the system:

\[ G(S) = \frac{1}{(S+3)^3} \]

(b) The open loop transfer function of a unity feedback system is given by

\[ G(S) \cdot H(S) = \frac{5}{S(S+1)(S+2)} \]

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

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(Continued)
4. (a) Determine the transfer function from the magnitude plot shown below:

(b) The characteristics equation for certain feedback control system is given below. Determine the range of $K$ for which the system is stable:

$$S^3 + 2KS^2 + (K + 2)S + 4 = 0$$
5. (a) What is an instrumentation amplifier? How a basic differential amplifier is modified to a grounded load instrumentation amplifier?

(b) For a Unity feedback system

\[ G(S) = \frac{10}{S(S+1)(S+4)} \]

Obtain analytically the gain margin and phase margin.

(1+3)+6

6. (a) Use block diagram reduction rules to obtain the transfer function of the block diagram shown below:

(b) Briefly explain the working principle of Dual-trace oscilloscope of a CRO.

5+5

[Internal Assessment — 10]