2022

M.Sc.

4th Semester Examination

ELECTRONICS

PAPER—ELC-403

CONTROL SYSTEMS AND INSTRUMENTATIONS

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.

1. Answer any *four* questions : 4×2

(a) The open loop transfer function of a control system is given by $\frac{S+3}{(S+4)(S+5)}$ and H(S) = 1. Determine the characteristic equation. 2

(b) Differentiate between open-loop and closed loop control system. 2

(c) The charactristic equation of a control system is given by $S^4 + 5S^3 + 4S^2 + 3S + 1 = 0$. Determine the stability of the system. 2

(d) A system transfer function is given by

$$\frac{(S+3)}{S^2(S+4)(S+5)}$$

Find out the type and order of the system. 1+1

(e) Mention different types of damping system depending upon the damping ratio. $\frac{1}{2} \times 4$

(f) Mention applications of DSO and CRO. 1+1

2. Answer any *four* questions : 4×4

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

$$\frac{10}{(S+2)(S+5)}$$

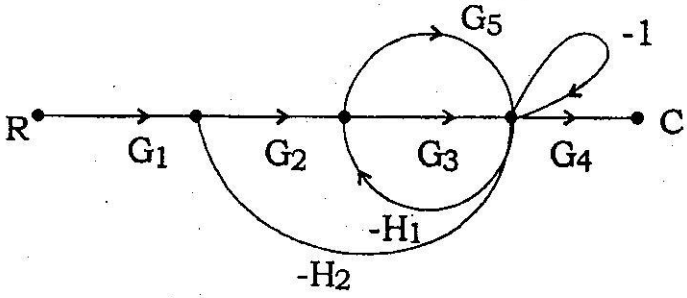
Determine the damping ratio, undamped natural frequency of oscillation. What is the percentage overshort of the response to a unit step input. 4

(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 error of the system. When the inputs are (i) 5 (ii) 5t (iii) $\frac{3t^2}{2}$. 4

(c) Determine the overall transfer function of the given system. 4



(d) The characteristic equation for a feedback control system is given by $S^4 + 20KS^2 + 5S^2 + 10S + 15 = 0$. Determine the range of K for the system to be stable. 4

(e) Define transducer. Differentiate between active and passive transducer. What is piezoelectric effect? 1+2+1

(f) What is the advantages of instrumentation amplefier? Draw instrumentation amplifier using three op-amp. 2+2

3. Answer any *two* questions : 2×8

(a) Consider a unity feedback control system with the following transfer function

$$G(S) = \frac{K}{S\left(S^2 + 4S + 8\right)}$$ 8

Plot the root locii of the system.

(b) Using Nyquist criterion, determine whether the closed loop system having following open loop transfer function is stable or not. 8

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

(c) Draw the Bodeplot of the open loop transfer function. 8

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

(d) Using block diagram explain operating principle of signal generator. 8

[Internal Assessment – 10]

———