2025

M.Sc. 3rd Semester Examination

ELECTRONICS

Paper : ELC - 303

(Control System and Instrumentation)

Full Marks : 50 Time : Two Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group - A

Answer any ***four*** questions : 2×4=8

1. The open loop transfer function of a system is given by $G(S)=\frac{6}{S(S+2)}$ and $H(S)=\frac{2}{(S+3)}$. Determine the characteristic equation.

2. Write two advantages of closed loop control systems. Give one example of closed loop control system. 1+1

3. What are the necessary condition of system's stability in terms of Routh-Hurwitz criterion?

4. The open loop transfer function of a unity feedback

P.T.O.

system is given by $G(S)=\frac{50}{(1+0.1S)(S+10)}$.

Determine the static error co-efficient K_p and K_v. 1+1

5. What are the differences between active and passive transducer?

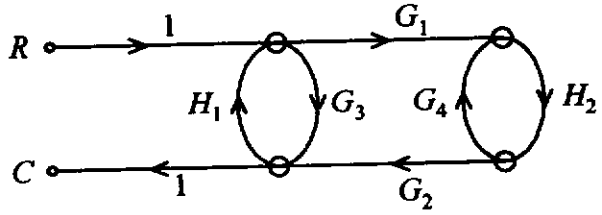
6. Write applications of spectrophotometers.

Group - B

Answer any ***four*** questions : 4×4=16

7. What are the advantages of signal flow graph over block diagram reduction technique?

Find the overall transfer function from the following signal flow graph.



1+3

8. The feedback system is described by the following transfer function :

$$G(S)=\frac{12}{S^2+4S+16},\ H(S)=KS$$

The damping factor of the system is 0.8. Determine the overshoot of the system and the value of K. 2+2

9. Utilize the Routh table to determine the number of roots of the following polynomials in the right half of S-plane. Comment about the stability of the system.

$$S^5+2S^4+3S^3+6S^2+10S+15$$ 3+1

10. Sketch the Bode plot for the system

$$G(S)=\frac{1}{(S+2)^3}.$$ 4

11. Explain the working principle of a resistive transducer with one practical example. 3+1

12. Explain the Wheatstone bridge method for measuring unknown resistance. 4

Group - C

Answer any *two* questions : 8×2=16

13. Consider a unity feedback control system with the following forward transfer function

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

Plot the root locii for the system.

P.T.O.

14. For the system shown below, sketch the Nyquist plot for $K = 1$ and use the Nyquist criterion to determine whether the closed loop system is stable for this gain. Find the range of K for the system to be stable.

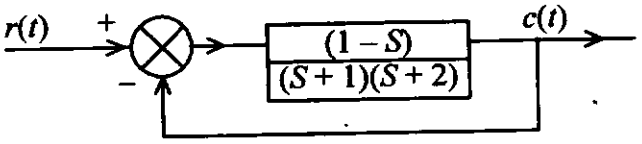


Fig. (a) : The system

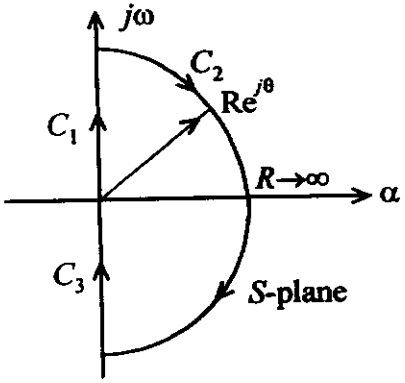


Fig. (b) : Nyquist contour 6+1+1

15. Explain the block diagram, working principle and application of ECG system. 2+5+1

16. Explain the working principle of function generator using proper block diagram. Write applications of DSO and spectrum analyzer. 5+1½+1½

[Internal Assessment - 10 marks]