M.Sc. 3rd Semester Examination, 2023

ELECTRONICS

(*Control System and Instrumentation*)

PAPER — ELC-303

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate **marks**

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

GROUP — A

Answer any **four** questions : 2×4

1. Write differentiation between block diagram reduction method and Mason's gain formula. 2

2. An open loop transfer function of a system is given by $G(s) = 5(S-2)/(S+3)$. Plot the pole-zero in the S plane and state about the system stability. 1 + 1

3. Define phase cross over frequency and gain cross over frequency. $1 + 1$

4. Write two applications of digital storage oscilloscope.   2

5. Draw the polar plot for the system $G(s) = k/(1+ST_1)(1+ST_2)$.   2

6. Determine the stability of the system whose open loop transfer function is given by $2S^4 + 2S^3 + S^2 + 3s + 2 = 0$.   2

GROUP – B

Answer any **four** questions : 4×4

7. A control system is given in the figure below. Determine the overall transfer function.   4

(*Continued*)
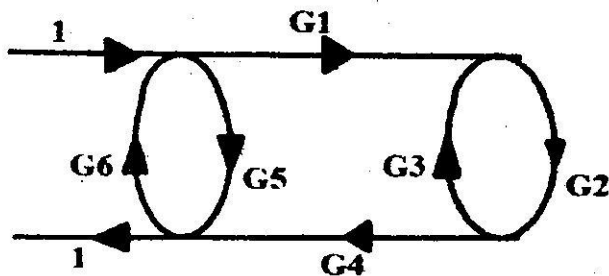
8. The open loop transfer function of a control system with unity feedback is given by $G(S)=10/(S+2)(S+5)$. Determine the damping ratio and undamped natural frequency of oscillation. What is the percentage overshoot of the response to a unit step input ? $1\frac{1}{2}+1\frac{1}{2}+1$

9. The characteristic equation of a control system is given below. Determine the range of values K for the system to be stable.   4

$$S^3+2KS^2+(K+2)S+4=0$$

10. Write short note on PID controller.   4

11. The open loop transfer function of a unity feedback system is given by

$$G(S)=50/(1+0.1S)(S+10).$$

Determine the static error co-effi-cients k_p, k_v and k_a. $2 + 1 + 1$

12. Write working *principle of piezo-electric* transducer.   4

GROUP — C

Answer any **two** questions : 8×2

13. Draw the root locus for a system whose open loop transfer function is given by
$$G(S)H(S)=K/S(S+4)(S^2+4S+20).$$ 8

14. Use Nyquist criterion, determine whether the closed loop system having the following open loop transfer function is stable or not.
$$G(S)H(S)=1/S(1+2S)(1+S)$$ 8

15. Draw and explain instrumentation amplifier using suitable circuit diagram. 3 + 5

16. Sketch the Bode plot for the transfer function
$$G(S)=1000/(1+0.1S)(1+.001S)$$
Determine the (*a*) phase margin (*b*) gain margin (*c*) stability of the system. 5 + 1 + 1 + 1

[*Internal Assessment* — **10 Marks**]

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