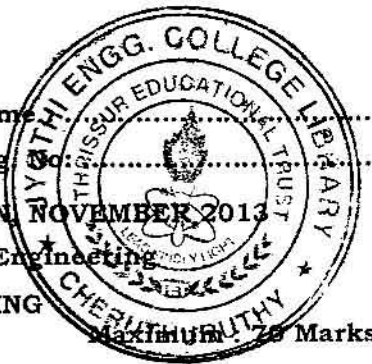50628

FIFTH SEMESTER B.TECH DEGREE EXAMINATION NOVEMBER 2013

Applied Electronics and Instrumentation Engineering

AI 09 503 – CONTROL ENGINEERING

Time : Three Hours   Maximum : 70 Marks

PART A
ANSWER ALL QUESTIONS

1. Define closed loop system.

2. Write the torque balance equation of an ideal rotational mass element.

3. What is steady state and transient response?

4. Define pole and zero.

5. Define controllability and observability.   (5X2 =10 MARKS)

PART B
ANSWER ANY FOUR QUESTIONS

6. Explain the rule (i) for eliminating negative feedback loop (ii) for moving the summing point ahead of a block.

7. State and explain the principle of superposition and homogeneity.

8. Explain first order and second order systems and their significance.

9. Explain Lag and Lead compensation.

10. State and explain Cayley Hamilton theorem.

11. A discrete time system is described by the difference equation,

    $y(k+2) + 3y(K+1) + 5y(k) = u(k)$. Determine the transfer function of the system.

                                                                (4X5 =20 MARKS)

PART C

12. (a) (i) State and explain Mason's gain formula.

    (ii) Explain basic properties of signal flow graph.

                        (or)

    (b) Write the analogous electrical elements in
        (i) force-voltage (ii) force-current and (iii) torque voltage
        analogy for the elements of mechanical systems.

13. (a) Sketch the root locus for the unity feedback system whose open loop
        transfer function is

                $G(s) = (K(s^2+6s+25)) / (s(s+1)(s+2))$

                        (or)

                                                            Turn over

(b) Discuss in detail about Routh Hurwitz stability criterion.

14. (a) Sketch the bode plot for the following transfer function and determine phase margin and gain margin.

$$G(s) = (75(1+0.2s)) / s(s^2+16s+100)$$

(or)

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

$G(s) = K / (s(1+0.5s)(1+0.2s))$. Using bode plot find the value of k so that (i) the gain margin of the system is 6 dB and (ii) the phase margin of the system is 25°.

15. (a) What is state transition matrix? Explain its properties. Obtain the state model of the system whose transfer function is $1 / (s^2+3s+2)$.

(or)

(b) A discrete-time system has the transfer function

$(Y(z)/U(Z)) = (4Z^3 -12Z^2+13Z-7) / ((Z-1)^2(Z-2))$

Determine the state model of the system (i) Phase variable form and (ii) Jordan Canonical form.

(4X10=40 MARKS)

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