Code No. 3044

FACULTY OF ENGINEERING
B.E. 3/4 (ECE) First Semester (Suppl.) Examination, June/July 2011
AUTOMATIC CONTROL SYSTEMS

Time : Three Hours]   [Maximum Marks : 75

Note :— Answer ALL questions of Part A. Answer FIVE questions from Part B.

PART—A (Marks : 25)

1. Why negative Feedback is preferred in control systems ?

2. What are the characteristics of servo motors ?

3. What is a synchro ? Write the applications of synchros.

4. Derive an expression for the transfer function of a single loop control system.

5. What are static error constants ? What is their significance ?

6. What do you mean by a PID controller ?

7. What are the advantages of the Root locus ?

8. Sketch the Bode Plot of $\dfrac{6}{s(s+6)}$.

9. State the Nyquist Stability Criterion.

10. What is the necessary and sufficient condition for output controllability of the systems ?

PART—B (Marks : 50)

11. Define transfer function of Linear time invariant system. Derive the transfer function of armature controlled DC Motor.

12. A unity Feedback system is characterized by an open loop transfer function $G(s) = \dfrac{K}{s(s+10)}$.

    Determine the gain K so that the system will have a damping ratio of 0·5. For this value of K determine the settling time, peak overshoot and time to peak overshoot for unit-step input.

13. Sketch the root locus of the system whose transfer function is $\dfrac{K}{s(s+5)(s+10)}$, comment on stability.

14. A system has $G(s)\,H(s) = \dfrac{K(s+2)}{s(s+4)(s+10)}$, find value of K to get phase margin equal to $+30°$.

15. What are the advantages and disadvantages of Digital Control System ? Explain architecture of digital control with suitable example.

16. (a) Write the properties of state transition matrix.

(b) The state equation of a linear time invariant system is given by :

$$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t).$$

Find the state transition matrix.

17. Write short notes on the following :—

(a) Compensation network

(b) Controllability

(c) Phase margin and Gain margin.