(Pages : 3) **A – 2861**

Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, May 2016
Branch : Electronics and Communication
08.603 : CONTROL SYSTEMS (T)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions : **(10×4=40 Marks)**

1. Distinguish between open loop and closed loop system.

2. A unit feedback system has a open loop transfer function of $G(s) = \frac{10}{(s+1)(s+2)}$. Determine the steady state error for the unit step input.

3. Define the following terms :
   a) Delay time
   b) Rise time
   c) Peak time
   d) Settling time

4. The specification given on a second order feedback control system is that the overshoot of the step response should not exceed 25%. What are the corresponding limiting values of the damping ratio and peak resonance ?

5. State and explain the Nyquist criterion of stability.

6. Test the stability of a system whose characteristics equation is $s^3 + 5s^2 + 6s + 30 = 0$.

7. Define gain crossover frequency and phase crossover frequency in bode plot.

8. What is lead compensator and draw its pole zero diagram.

9. What are the properties of state transition matrix ?

10. Obtain the eigen values for the following matrix :

$$A = \begin{bmatrix} 2 & -5 \\ -2 & 4 \end{bmatrix}$$

P.T.O.

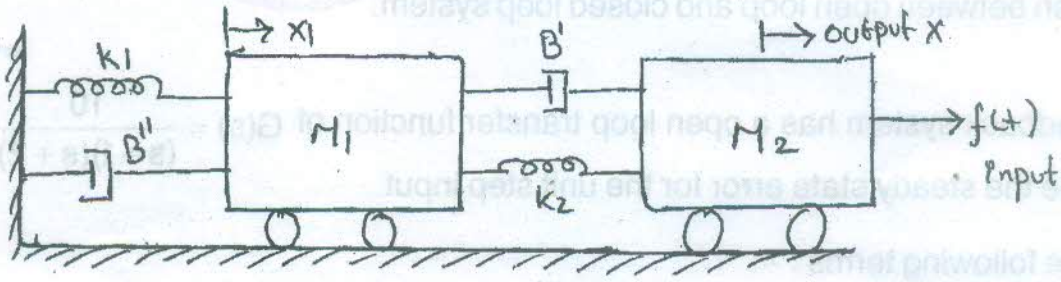
PART – B

Answer **any 2** questions from **each** Module : **(6×10=60 Marks)**

Module – 1

11. A unity feedback system is given as $G(s) = \frac{1}{s(s+1)}$. The input to the system is described by $r(t) = 4 + 6t + 2t^2$. Find the generalized error co-efficients and steady state error. **10**

12. Obtain the transfer function of mechanical system shown in following figure : **10**



13. Obtain the state space representation of a DC armature controlled motor. **10**

Module – 2

14. The open loop transfer function of an unity feedback system is given by $G(s) = \frac{1000(1+0.2s)}{s(1+0.1s)}$. Draw the bode plot and hence find phase margin and gain margin. **10**

15. Sketch the root locus for a system whose loop transfer function is $G(s)H(s) = \frac{k(s+1)}{s^2+4s+13}$. **10**

16. Sketch the Nyquist plot for a system with open loop transfer function $G(s)H(s) = \frac{k(s+1)(1+0.4s)}{(1+8s)(s-1)}$. Determine the range of K for which the system is stable. **10**

Module – 3

17. A system is described by

$$\dot{X} = \begin{bmatrix} 0 & 0 & 1 \\ -2 & -3 & 0 \\ 0 & 2 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} u$$

$$Y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix}$$

Check the controllability and observability of the system. 10

18. Solve for X(t) using the state equation given below :

$$\dot{X} = \begin{bmatrix} 0 & 2 \\ -10 & -8 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \quad u(t) \text{ is step function}$$

$$X(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}.$$ 10

19. Explain the steps to design the control system via pole placement technique. 10
