(ii) What is Routh criterion? Determine the range of values of K, for which the system is stable for the characteristic equation (13)

$$s^4 + s^3 + 3ks^2 + (k+2)s + 4 = 0$$

**Or**

(b) Sketch the root locus for the system (16)

$$G(s) = \frac{K(s+2)}{(s+3)^2(s^2+2s+17)}$$

15. (a) Obtain the time response of the following system (16)

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$ assuming initial condition initial condition $X(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$

**Or**

(b) (i) Define controllability and observability. Check whether the following system is controllable and observable. (10)

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

$$Y = [3 \quad 4 \quad 1]X$$

(ii) Explain the operation of sample and hold device with neat diagram. (6)

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# M341

B.E./B.TECH. DEGREE EXAMINATIONS, MAY/JUNE–2011

REGULATIONS 2008

FOURTH SEMESTER

**EC 46 – CONTROL SYSTEMS**

ELECTRONICS AND COMMUNICATION ENGINEERING

Time: Three Hours Maximum: 100 marks

ANSWER ALL QUESTIONS

PART–A (10×2=20 marks)

1. Distinguish between open loop and closed loop system.
2. Write the analogous electrical elements in force-current analogy for the elements of translational system.
3. Define peak overshoot.
4. State the relation between generalized and static error coefficients.
5. Define gain margin.
6. What are M and N circles?
7. What is Nyquist stability criterion?
8. How stability analysis is carried out using MATLAB?
9. What are the advantages of state modeling using physical variables?
10. List the properties of state transition matrix.

PART–B (5×16=80 marks)

11. (a) Find closed loop transfer function of the system in fig.1 using block reduction technique and verify the same using signal flow graph. (16)

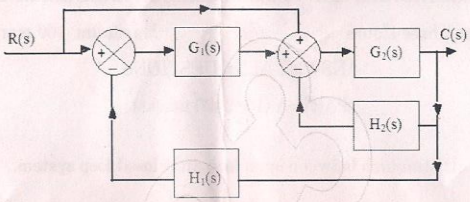


fig.1

**Or**

(b) Define transfer function. Obtain the transfer function $e_2/e_1$ for the system shown in fig.2. (16)

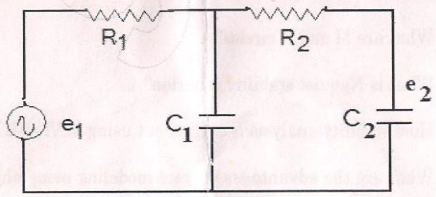


fig.2





12. (a) (i) Explain the standard test signals. (6)

(ii) Obtain the unit step response of the system with closed loop transfer function $G(s) = \frac{10s+10}{s^2+10s+10}$ (10)

**Or**

(b) (i) Explain the effect of PI controller. (6)

(ii) For unity feedback system having open loop transfer function as (10)

$$G(s) = \frac{K(s+2)}{s^2(s^2+7s+12)}$$

Determine

(a) Type and order of the system

(b) Static error constants

(c) Steady state error for parabolic input.

13. (a) Sketch the Bode plot for the transfer function (16)

$$G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$$

**Or**

(b) (i) Discuss the use of Nichols chart in control system analysis in detail. (8)

(ii) Explain the different types of compensators with neat diagrams. (8)

14. (a) (i) Define BIBO stability. (3)