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Reg. No. : .....

Name : .....

Eighth Semester B.Tech. Degree Examination, April/May 2012
(2008 Scheme)
08.835 – DISCRETE CONTROL AND NAVIGATION SYSTEMS (T)

Time: 3 Hours Max. Marks : 100

PART – A

Answer **all** questions.

1. Obtain the transfer function of a zero order hold circuit. Also draw the frequency characteristic.

2. List the steps involved in determining the Pulse Transfer Function G (z) from G (s).

3. Find the stability of the following system using Jury's test
   $P(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$.

4. Obtain the state-space representation of the following transfer function such that the state matrix is diagonal

$$\frac{Y(z)}{R(z)} = \frac{z^3 + 8z^2 + 17z + 8}{(z+3)(z+2)(z+1)}$$

5. Explain Liapunov stability analysis.

6. Draw the block diagram of Full Order Observer and explain briefly.

7. Explain servo systems.

8. Explain Doppler principle with necessary equation.

9. Describe various methods used for speed measurement.

10. Briefly explain the principle of autopilot system.

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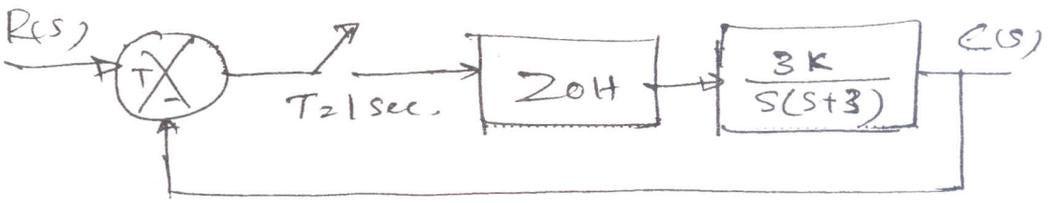
PART – B

Answer **any two** questions from **each** Module. **20** marks for **each** Module.

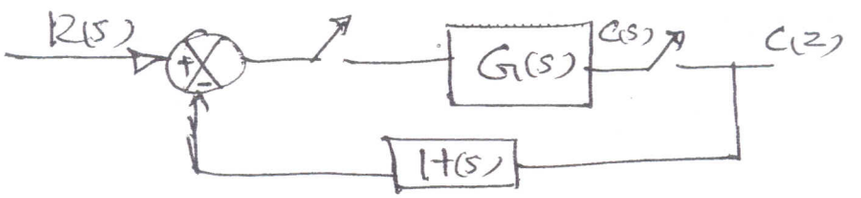
Module – I

11. Find the range of gain, K to make the system stable



12. a) The Input-Output relation of a sampled data system is described by the equation $y(k+2) + 5y(k+1) + 6y(k) = x(k+1) - x(k)$. Determine the Pulse Transfer Function. **5**

    b) Obtain the expression for Pulse Transfer Functions for the following closed loop Discrete-Time. Control system. **5**



13. Explain the general rules for constructing Root Loci in detail.

Module – II

14. Obtain the Jordan-Canonical form realization for the following transfer function

$$\frac{Y(z)}{R(z)} = \frac{3z^3 - 4z + 6}{\left(z - \frac{1}{3}\right)^3}$$

15. Consider the system described by the equations

$X_1 (k + 1) = 2 x_1 (k) + 0.5 x_2 (k) - 5$

$X_2 (k + 1) = 0.8 x_2 (k) + 2$. Investigate the stability of the equilibrium state. Use the direct method of Liapunov.

16. Check the controllability and observability of the following system

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -5 & -1 \\ 3 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 & 0 \\ 5 & 1 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Module – III

17. Explain Loran-C Charts. How position can be fixed using Lorain-C Charts ?

18. Explain different types of techniques used for depth measurement in detail.

19. a) Explain how GPS is used for satellite navigation.

    b) Explain GPS antennas and GPS receiver architecture in detail.

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