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Reg. No. : .....

Name : .....

Eighth Semester B.Tech. Degree Examination, May 2013
(2008 Scheme)
08.835 : DISCRETE CONTROL AND NAVIGATION SYSTEMS (T)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all**.

1. Explain the conditions to be satisfied for reconstruction of a sampled signal into a continuous signal.
2. Explain zero order hold device.
3. Explain the advantages and disadvantages of digital systems.
4. What are the different types of sampling operations ? Explain.
5. Explain the procedure for obtaining the pulse transfer function of a closed loop transfer function.
6. Find stability of the following system using Jury's test $F(z) = 4z^2 + 2z + 1$.
7. Explain the principle of depth measurement by echo sounder.
8. Explain the principle of Doppler shift.
9. Explain Radar as a navigation device.
10. With a diagram explain the concept of auto pilot. What are its advantages ?

(10×4=40 Marks)

P.T.O.

PART – B

Answer **any two** from **each** Module.

Module – I

11. a) Explain the basic digital control scheme with a block diagram.

    b) Define the following parameters :
    i) Acquisition time
    ii) Aperture time
    iii) Settling time.

12. Consider the closed loop transfer function given by $H(z) = 0.5\,(z + 0.74)/z^2 - 1.2\,z + 0.5$. Draw the pole-zero configurations of the given system. Discuss the stability of the system.

13. Discuss different methods employed for stability analysis of discrete control systems.

Module – II

14. a) Explain the concept of controllability and observability of discrete time control systems.

    b) Examine whether the discrete system

    $X(K + 1) = A\,X(K) + B\,u(K)$

    $C(K) = D\,X(K)$

    where $A = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix}, B = \begin{bmatrix} 1 \\ -1 \end{bmatrix}, D = [1 \quad 0]$ is state controllable.

15. a) Define state transition matrix and explain its properties.

    b) Obtain the discrete time state and output equations and the pulse transfer function of the following system described by

    $$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix}; y = [1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

    make suitable assumptions wherever necessary.

16. a) Explain Lyapunov stability theorem.

    b) Examine whether the system

    $X(K + 1) = A\,X(K) + B\,u(K)$

    $C(K) = D\,X(K)$

    where $A = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$, $D = [0 \quad 1]$ is

    i) Output controllable

    ii) Observable.

Module – III

17. Explain different acoustic methods used for depth measurements.

18. Explain LORAN-C Navigation system. Explain how a position fix is obtained in LORAN-C.

19. With detailed diagrams explain GPS as a satellite navigation system. Explain how a GPS receiver computes the co-ordinate values of a point on earth's surface.

(6×10=60 Marks)