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Name.....

Reg. No.....

FIRST SEMESTER M.TECH. DEGREE EXAMINATION, DECEMBER 2013

Power Electronics and Drives

EPD/EPE/EPS 10 102—SYSTEM DYNAMICS

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions,*
choosing at least **one** *question from each module.*

1. (a) Find the eigen values and eigen vectors representations for the following matrices :

(i) $\begin{bmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{bmatrix}$. (ii) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -4 & -3 \end{bmatrix}$.

(10 marks)

(b) Show that if λ_i is an eigenvalue of matrix A, then $f(\lambda_i)$ is an eigenvalue of the matrix function of $f(A)$.

(10 marks)

Or

2. (a) Explain the solution of linear time invariant continuous-time state equations. (10 marks)

(b) Describe any *two* Canonical forms of state space representations of discrete time systems.

(10 marks)

3. State and prove the different types of theorems for stability analysis of L.T.I. systems.

(20 marks)

Or

4. Consider the non-linear system :

$$\dot{x}_1 = -x_1 - x_2^2$$
$$\dot{x}_2 = -x_2$$

(i) Find a region of asymptotic stability using Krasovskii method.

(ii) Apply variable gradient method to investigate stability for the system.

(20 marks)

5. State and prove, the controllability and observability tests for continuous time systems.

(20 marks)

Or

Turn over

6. Convert the following state model into the Jordan Canonical form and therefrom comment on controllability and observability :

$$\dot{x}(t)=\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -4 & -3 \end{bmatrix} x(t)+\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ -1 & 1 \end{bmatrix} u(t)$$

$$y(t)=\begin{bmatrix} 0 & 1 & -1 \\ 1 & 2 & 1 \end{bmatrix} x(t).$$

(20 marks)

7. Discuss the different types of control problems to provide some physical motivation for the selection of a performance measure.

(20 marks)

Or

8. Explain the different methods for the solution of reduced Riccatti method with necessary derivations and diagrams.

(20 marks)