

Code: 17EEPC1T2

I M.Tech - I Semester–Supplementary Examinations February 2020

MODERN CONTROL THEORY (POWER SYSTEM & CONTROL)

Duration: 3 hours

Max. Marks: 60

Answer the following questions.

1. a) Define Eigen Values and Eigen vectors.

5 M

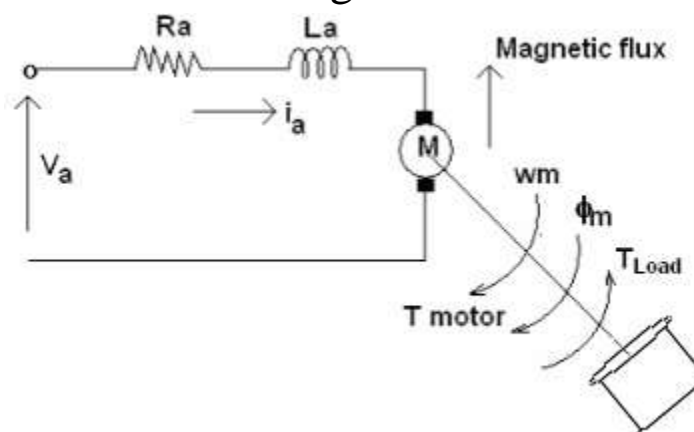
b) Find Eigen values and Jordon Canonical form for the following matrix

$$\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -4 & -3 \end{bmatrix}$$

10 M

(OR)

2. Consider the DC motor system shown in figure. Obtain its state Diagram and block diagram.



15 M

3. a) Derive state transition matrix and write its properties.

5 M

b) Consider the state model for a system characterized by the differential equation.

$$\frac{d^3 y}{dt^3} + 6 \frac{d^2 y}{dt^2} + 11 \frac{dy}{dt} + 6y = u(t)$$

Give the block diagram representation of the state model.

10 M

(OR)

4. a) Explain the concept of controllability and observability?

5 M

b) Consider a system satisfying the differential equations

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

Is this system controllable?

10 M

5. a) Explain the following nonlinearities i) Saturation and ii) Dead-zone.

8 M

b) Write the differences between linear and Non-linear system.

7 M

(OR)

6. a) Define Lyapunov's stability and Instability Theorem.

7 M

b) Consider a non-linear system described by the equations:

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

$$\dot{x}_2 = -x_2$$

Check the stability of the system by use of variable gradient method. 8 M

7. a) State and explain the principle of optimality. 7 M

b) Explain the Formulation of Optimal control problems. 8 M

(OR)

8. a) Discuss the generalized boundary condition. 7 M

b) Explain the term-Linear quadratic regulator. 8 M