

**GUJARAT TECHNOLOGICAL UNIVERSITY****M.E Sem-I Remedial Examination April 2010****Subject code: 710703****Date: 08 /04 /2010****Subject Name: Modern Control System****Time: 12.00 noon – 02.30 pm****Total Marks: 60****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

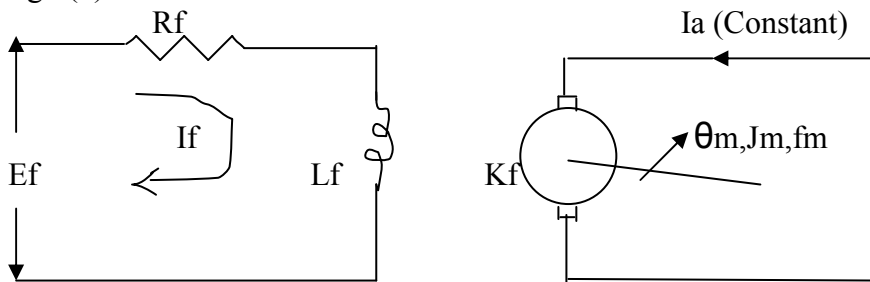
**Q:1 a)** Explain the concept of state, state variables and state model (06)**b)** Obtain the state equations for the field controlled D.C motor shown in fig 1(b) (06)

fig 1(b)

**Q:2 a)** List the steps for constructing state space representation using canonical variables. (06)**b)** How the state variables method can be used to represent discrete-time system? (06)**OR****b)** Explain : 'Controllability' (06)**Q:3 a)** Explain : State Transition Matrix (06)**b)** List the properties of state transition matrix. (06)**OR****Q:3 a)** Explain the concept of 'Transfer Matrix' for state space representation. (06)**b)** Define : 'Observability' (06)**Q:4 a)** Find the inverse of matrix. (06)

$$A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$$

**b)** Find the rank of the matrix. (06)

$$A = \begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$$

**OR**

**Q:4 a)** Express the matrix A as a sum of a symmetric and a skew – symmetric matrix; where (06)

$$A = \begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}$$

**b)** List various types of matrices with illustration. (06)

**Q:5 a)** Solve the following different equation by matrix method. (10)

$$d^2x / dt^2 - 5dx/dt + 6x = 0, \quad x(0) = 1, \quad x'(0) = 2$$

**b)** Is the rank of a matrix, affected by elementary transformation? (02)

**OR**

**Q:5 a)** By neat diagram explain : ‘Asymptotic stability’ (04)

**b)** Explain : Liapunov’s stability criteria (08)

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