

Total No. of Questions : 8]

SEAT No. :

P3907

[5561]-577

[Total No. of Pages : 2

B.E. (Electrical)

CONTROL SYSTEM - II

(2015 Course) (Semester - I) (403145)

Time : 2½ Hours]

[Max. Marks : 70

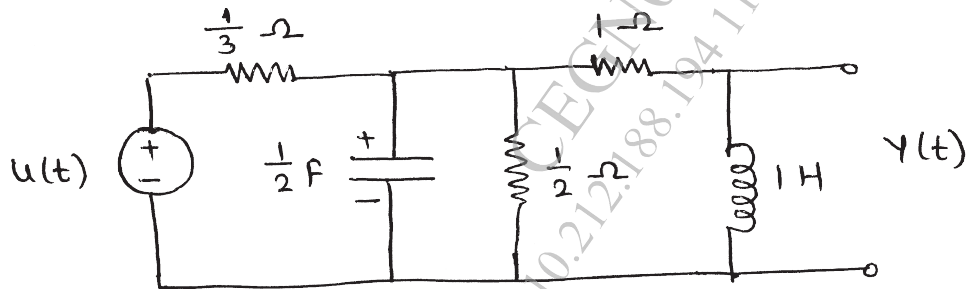
Instructions to the candidates:

- 1) Answer any one question from each pair of questions : Q.1 & Q.2, Q.3 & Q.4, Q.5 & Q.6, Q.7 & Q.8.
- 2) Figures to the right side indicate full marks.

- Q1)** a) What is holding device? Explain the reconstruction process using hold circuit. [6]
b) State and derive different properties of Z-transform. [6]
c) Using Long Division method determine the inverse Z-transform of $X(z) = \frac{1 + 2z^{-1}}{1 - 2z^{-1} + z^{-2}}$; When $x(k)$ is causal. Also define causal sequence. [8]

OR

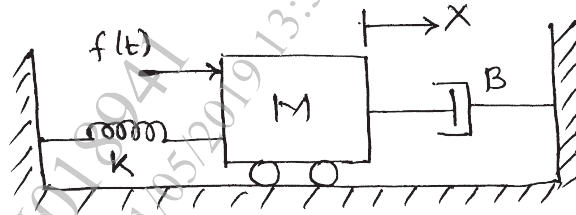
- Q2)** a) Derive an expression for transfer function of Zero Order Hold device. [6]
b) In case of pulse transfer function, discuss properties for starting operation. [6]
c) Determine the stability by using bilinear transformation of the system whose characteristic equation is $z^3 - 0.2z^2 - 0.25z + 0.05$. [8]
- Q3)** a) Obtain the transfer function of a control system from its state space model. [4]
b) Explain how to obtain state model by direct decomposition of transfer function. [6]
c) For the system shown in figure, obtain the state equation. [8]



OR

P.T.O.

- Q4)** a) Explain the procedure to obtain state model of system using parallel programming. [4]
 b) Derive an expression for state model of armature control DC motor. [6]
 c) Write the state equations for a mechanical system shown in figure. [8]



- Q5)** a) What do you mean by homogeneous and non homogeneous system? Obtain the solution of non homogeneous state equation. [6]
 b) For the given matrix find the diagonalization matrix. [10]

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

OR

- Q6)** a) Explain any two methods to determine state transition matrix. [6]
 b) Find eigen values, eigen vectors and modal matrix for, [10]

$$A = \begin{bmatrix} 0 & 0 & 1 \\ 2 & 0 & 0 \\ 8 & 2 & -5 \end{bmatrix}$$

- Q7)** a) Explain both methods of testing observability of control system. [6]
 b) Design state feedback gain matrix for the given system such that desired closed loop poles are at $S = -2 + j2\sqrt{3}$ and $S = -2 - j2\sqrt{3}$.

Also for the same system find observer gain matrix such that observer poles are located at $S = -8$ and $S = -8$. State model matrices are

$$A = \begin{bmatrix} 0 & 1 \\ 0 & -2 \end{bmatrix}; B = \begin{bmatrix} 0 \\ 4 \end{bmatrix}; C = [1 \ 0]. \quad [10]$$

OR

- Q8)** a) Draw and explain block diagram of full order state observer. [6]
 b) Describe any two methods of evaluating state feedback gain matrix. [10]

