Total No. of Questions : 8]

SEAT No. : ____

P3907

[Total No. of Pages : 2

[5561]-577
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]**

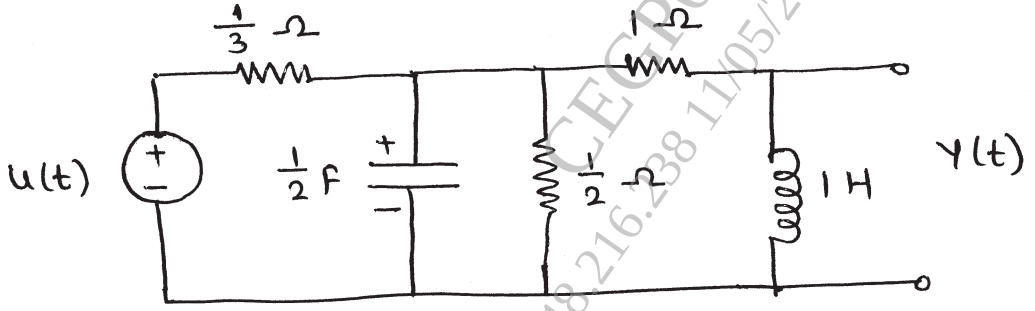
b) In case of pulse transfer function, discuss properties for starring operation. **[6]**

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

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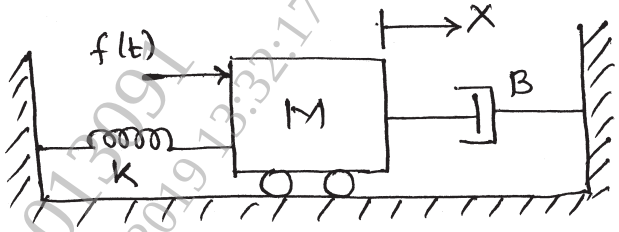
Q4) a) Explain the procedure to obtain state model of system using parallel programming. **[4]**

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

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