B.L.D.E. Association's

VACHANA PITAMAHA DR.P.G.HALAKATTI

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QUESTION PAPERS

1st & 2nd.SEMESTER

M.TECH

ELETRICAL & ELETRONIC

DEC.2018/JAN2019

INDEX

M.Tech EE

CBCS SCHEME

USN | | | | | | | | | | |

18EMS12

First Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Analysis of Linear Systems

Time: 3 hrs. Max. Marks: 100

Note: ***Answer FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define : i) State ii) State variables iii) State space iv) State trajectory. **(04 Marks)**

b. Determine the state model for the given electrical circuit shown in Fig.Q1(b). **(10 Marks)**

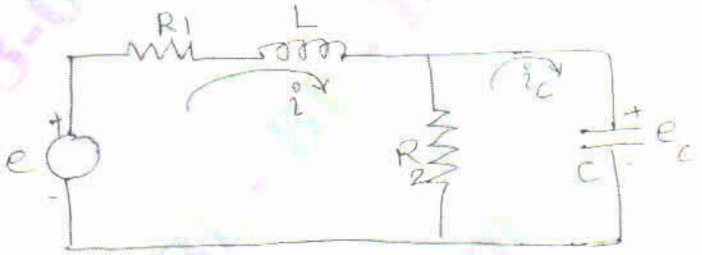

Fig.Q1(b)

c. Show that the state model of a given system is not unique. **(06 Marks)**

OR

2 a. Show that eigen values are invariant under linear transformation. **(04 Marks)**

b. Obtain the state model of the system whose transfer function is given by

$$\frac{Y(s)}{U(s)} = \frac{10(s+4)}{s(s+1)(s+3)}.$$ **(08 Marks)**

c. Construct the state diagrams for the system with $TF = \frac{Y(s)}{U(s)} = \frac{10}{[s^3+4s^2+2s+1]}$. **(08 Marks)**

Module-2

3 a. Explain the digital control system with block diagram. **(08 Marks)**

b. Derive pulse transfer function. **(06 Marks)**

c. Obtain the pulse transfer function G(z) of the system shown in Fig. 3(c) where $G(s) = \frac{1}{s+a}$.

Fig.Q3(c) **(06 Marks)**

OR

4 a. What are quantizing and quantization error? Explain in brief. **(08 Marks)**

b. Obtain the diagonal canonical form of state model for the system represented by the difference equation : $y(k+2) + 5y(k+1) + 6y(k) = u(k)$. Assume zero initial conditions. **(06 Marks)**

c. Obtain the state model for the system shown in Fig.Q4(c). **(06 Marks)**

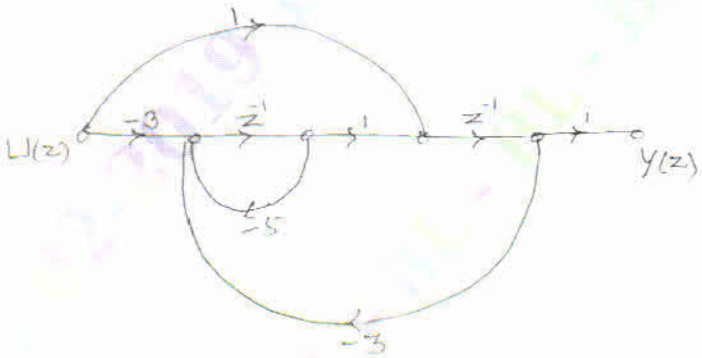

Fig.Q4(c)

Module-3

5 a. Evaluate state transition matrix using :

i) Lapalce transform method

ii) Caytey Hamilton method

For the system with $A = \begin{bmatrix} 0 & 2 \\ -2 & -4 \end{bmatrix}$. **(12 Marks)**

b. Derive pulse transfer function matrix. **(08 Marks)**

OR

6 a. Obtain for the discrete time state equation state transition matrix :

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}.$$ **(10 Marks)**

b. Compute time response of the system given by :

$$\overset{\circ}{x}(t) = \begin{bmatrix} 0 & 1 \\ -2 & 0 \end{bmatrix} x(t);\ x(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \text{ and } y(t) = [1\ -1]x(t).$$ **(10 Marks)**

Module-4

7 a. Check controllability and observability for the following system :

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix};\ B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}\ C = [3\ 4\ 1].$$ **(10 Marks)**

b. Explain controllability and observability tests of state model in Jord canonical form for discrete time systems. **(10 Marks)**

OR

8 a. Explain in brief loss of controllability and observability due to sampling. **(08 Marks)**

b. Consider a system described by the state equation $\mathring{x}(t) = Ax(t) + bu(t)$, where

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix};\ B = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$$ check for controllability of the system. **(06 Marks)**

c. Show that the following system is not completely observable :

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix} y(k) = [0 \quad 1] \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}.$$ **(06 Marks)**

Module-5

9 a. The plant model is given by :

$$\mathring{X} = AX + bu \ \text{ with } A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \ b = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

Calculate the state feedback gain matrix 'K' where the desired pole locations are at $S = -4 \pm j4$. **(10 Marks)**

b. For a single input system, derive the expressions for transformation matrix 'P' which puts the system matrix 'A' in controllable companion form. **(10 Marks)**

OR

10 a. Write a note on full order state observer with block diagram. **(10 Marks)**

b. For the single input single output system $\mathring{x} = \begin{bmatrix} 0 & 1 \\ 1 & -2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ $y = [1 \quad 2]x$. check wherever system remains controllable and observable after introducing a feedback signal $u = r + [2 \quad -1]x$. **(10 Marks)**

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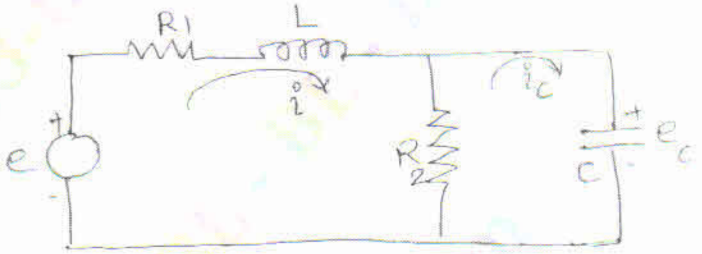

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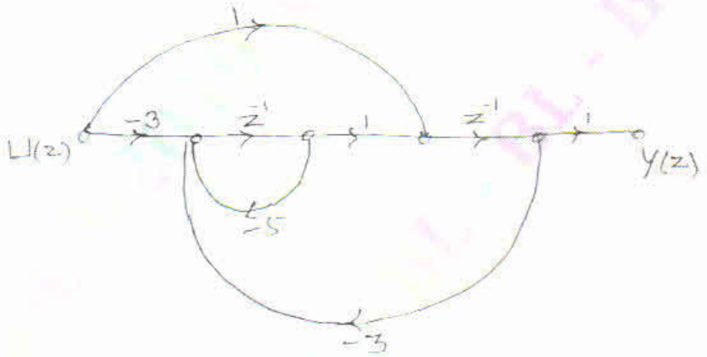

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