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# 328415(28)

## B. E. (Fourth Semester) Examination, 2020

(Old Scheme)

(AEI, EI & Et&T Branch)

## SIGNALS & SYSTEMS

*Time Allowed : Three hours*

*Maximum Marks : 80*

*Minimum Pass Marks : 28*

***Note :** Attempt all questions. Part (a) from each question is compulsory and carries 2 marks. Attempt any two parts from parts (b), (c) and (d) of each part carries 7 marks.*

### Unit - I

1. (a) What are elementary signals? Explain. 2

(b) Find the periodicity of the signals if they are periodic : 7

(i) $x(t) = 2\cot(t) + 3\cos(t/3)$

(ii) $x(n) = e^{j\pi n/4}$

(c) Sketch and determine whether the signals are power or energy signals : 7

(i) $x(t) = e^{-at}$

(ii) $x(t) = t \cdot u(t)$

(d) Explain classification of systems. 7

## Unit - II

**2.** (a) Write Dirichlet's conditions for Fourier series. 2

(b) State and prove Parseval's theorem. 7

(c) Determine magnitude and phase spectrum of the signal :





$$x(t) = \begin{cases} A & , \quad -T \le t \le 0 \\ -A & , \quad 0 \le t \le T \\ 0 & , \quad \text{otherwise} \end{cases}$$

(d) Determine the Laplace transform of $x(t)$ : 7

$$x(t) = e^{-at} \sin wt$$

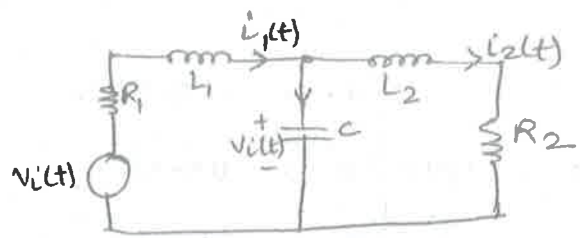
## Unit-III

**3.** (a) How linear time invariant (LTI) system can be characterised? 2

(b) The input signal $x(t)$ and the impulse response $h(t)$ of a continous time system are given as :

$x(t) = e^{-3t}u(t)$ and $h(t) = u(t^{-1})$ find the output. 7

(c) Obtain the state variable model of following RLC circuit using physical variables :




(d) The transfer function of the system is given as : 7

$$H(s) = \frac{s^2+s+5}{s^3+6s^2+8s+4}$$

obtain the state variable model using the phase variables.

## Unit-IV

4. (a) List various properties of DTFT. 2

(b) Determine the fourier transform of a rectangular pulse $x(n)$ of length '$L$'. 7

$$x(n) = \begin{cases} A & , \quad \text{for } 0 \le n \le L^{-1} \\ 0 & , \quad \text{otherwise} \end{cases}$$





(c) Determine inverse z-transform of the following $x(z)$ :

$$x(z) = \frac{z+2}{2z^2-7z+2}$$

(d) Discuss advantages of z-transform over fouriour transform. Explain any 5 properties of z-transform. 7

## Unit - V

5. (a) Write conditions of causality and stability of discrete time LTI system. 2

(b) Check the stability of the descrete time system described by : 7

$$y(n) = y^2(n-1) + x(n)$$

(c) The impulse response of a discrete time LTI system is $h(n) = \{1, 1, 1, 1, -1, -1\}$ and

$$x(n) = \{0, 0, 1, 0, -1\}.$$

Determine and sketch the output. 7

(d) Solve the differential equation given as : 7

$$\frac{dy(t)}{dt} + 3y(t) = x(t)$$

Where $y(t)$ and $x(t)$ are the output and input of the system.