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328455 (28)

BE (4th Semester)

Examination, Nov.-Dec., 2021

Branch : Et & T

SIGNALS AND SYSTESM (NEW)

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : (i) Part (a) is compulsory for every unit.

(ii) Attempt any two parts from (b), (c) & (d).

Unit-I

Q. 1. (a) Define causal & non-causal system with example. 2

(b) Check whether the given signals are energy signal or power signal or neither : 7

(i) $x(t) = e^{-a|t|}$ for $a > 0$

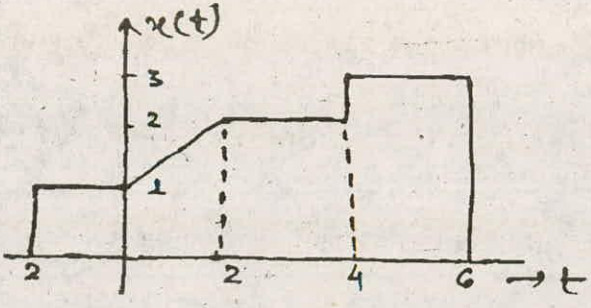
(ii) $x(t) = e^{-5t}\, u(t)$

(c) (i) For the given signal x(t). Plot the following wave forms : 3

(1) x(2t)

(2) x(–t)

(3) x(t + 1)



(ii) Draw even & odd components of x(n) : 4

$$x(n) = \{2, 4, 6, 8\}$$

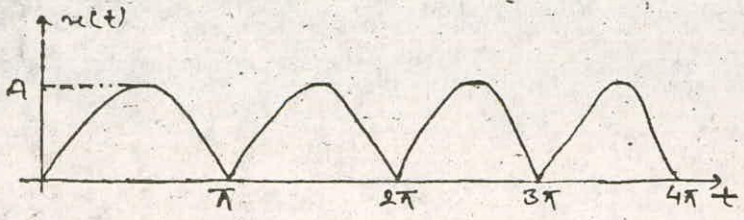
(d) (i) Write the difference between energy & power signal. 4

(ii) If $y_1(t)$ & $y_2(t)$ are two periodic signals with two periods T_1 & T_2 respectively. Find the suitable condition, so that $y(t) = y_1(t) + y_2(t)$ will be periodic. What will be the fundamental period of y(t). 3

Unit-II

Q. 2. (a) Write Dirichlet condition for the existence of Fourier series. 2

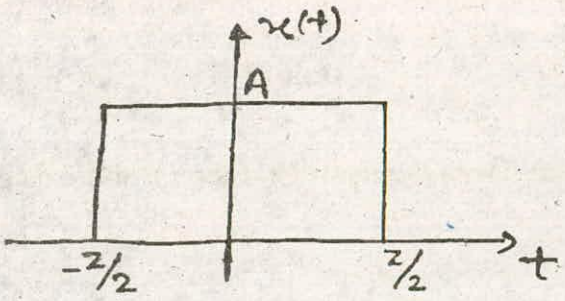
(b) Find the trignometric Fourier series of full wave rectified signal shown below : 7



(c) Write & prove any seven properties of Fourier transform. 7

(d) Find the Fourier transform of the following signal :

(i) x(t) = Gate function 3



(ii) $x(t) = A \cos w_o t$ 2

(iii) $x(t) = A \sin w_o t$ 2

Unit-III

Q. 3. (a) Write the condition for stability & causality of any discrete sequence h(n). 2

(b) Determine the z-transform of the following signal & also plot its ROC. 7

$$x(n) = 2^n u(-n) + 3\left(\frac{1}{2}\right)^n u(n)$$

(c) Find the inverse z-transform of x(z) using partial fraction method : 7

$$x(z) = \frac{1 - \frac{1}{2}z^{-1}}{\left(1 + \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}\right)}, |z| > \frac{1}{2}$$

(d) Given an LTI system with system function :

(i) $H(z) = \dfrac{1}{(1 - 0.2z^{-1} + 0.4z^{-2} + 0.8z^{-3})}$ 4

(ii) $H(z) = \dfrac{1}{\left(1 - \frac{1}{4}z^{-1}\right)}$ 3

find difference equation for both.

Unit-IV

Q. 4. (a) Define transfer function. 2

(b) By using continuous time convolution integrals find out the response of the system to unit step input signal, impulse response is given by : 7

$$h(t) = \frac{R}{L} e^{-tR/L} u(t)$$

(c) A causal LTI discrete time system is described by the following difference equation :

$$y(n) = \frac{4}{5} y(n-1) + x(n)$$

Determine :

(i) impulse response

(ii) step response

(iii) Is the system stable ? 7

(d) Consider an LTI system with input x(n) & impulse response h(n) given as : 7

$x(n) = 2^n u(-n)$

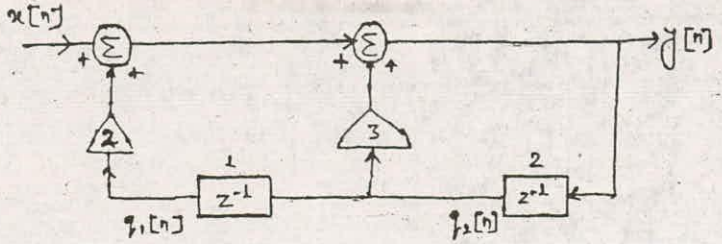
$h(n) = u(n)$

find the output of the system using convolution sum.

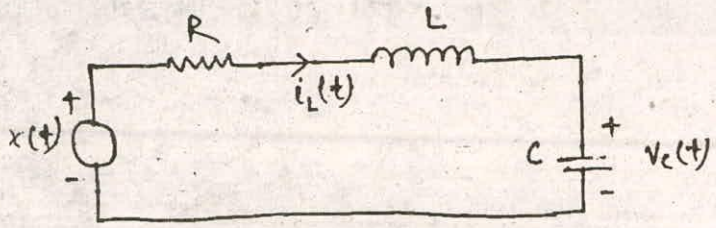
Unit-V

Q. 5. (a) Define state of the system. 2

(b) Consider the discrete time LTI system shown below in figure. Find the state space representation of the system by choosing the output of unit-delay element-1 and element-2 as state variable $q_1[n]$ & $q_2[n]$ respectively. 7



(c) Consider the RLC circuit shown in below figure. Let the output y(t) be the loop current. Find a state space representation of the ckt. 7



(d) Find state equation of a discrete-time system described by : 7

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n]$$