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328455(28)

B. E. (Fourth Semester) Examination, April-May 2021

(New Scheme)

(ET & T Engg. Branch)

SIGNALS and SYSTEMS

Time Allowed : Three hours

Maximum Marks : 80

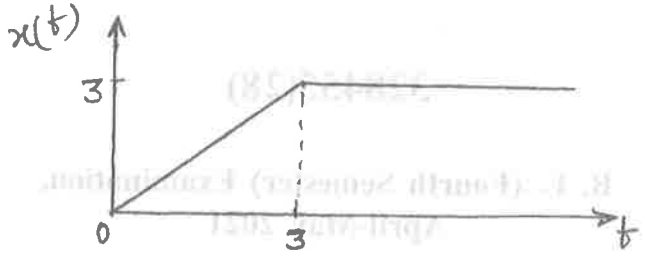
Minimum Pass Marks : 28

Note : *Part (a) of each question is compulsory & carries 2 marks. Solve any two from (b), (c) and (d) and carries 7 marks.*

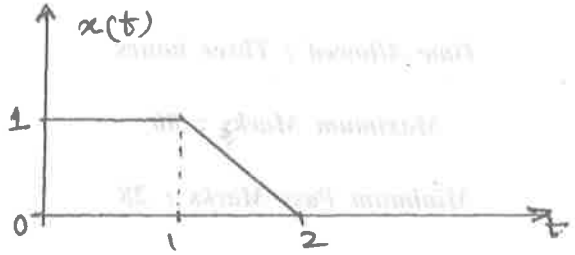
Unit-I

1. (a) Define deterministic and random signals with examples. 2

(b) Determine whether the signal is energy signal or power signal. 7



(c) Sketch the plot $\left(x\frac{3}{2}t+1\right)$ for $x(t)$ given in figure. 7



(d) Determine the properties of the system for 7

$$y[n]=3y^2[n-1]-nx[n]+4x[n-1]-x[n+1]$$

(i) Memoryless/with memory

(ii) Time variant / Invariant

(iii) Linear / Non Linear

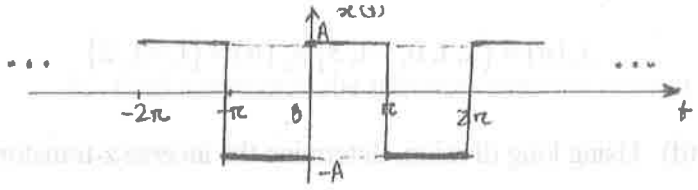
(iv) Anticipative / Non anticipative

(v) Stable / Unstable

Unit-II

2. (a) Define Dirichlet's conditions for the existence of fourier series. 2

(b) Obtain the trigonometric fourier series for the waveform shown. 7



(c) Find the Fourier Transform of $x(t)=1/t$. 7

(d) Find the Inverse Fourier transform of

$$X(w)=\frac{jw}{(2+jw)^2}.$$ 7

Unit-III

3. (a) Explain Region of convergence for Z-transform. 2

(b) Determine the z-transform of the given sequence. Also sketch the ROC and Poles zero location. 7

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

(c) Using z-transform, find the convolution of the sequence. 7

$$x_1(n)=\{2,1,0,-1,3\}\; x_2(n)=\{1,-3,2\}$$

(d) Using long division, determine the inverse z-transform of $X(z)=\dfrac{z^2+2z}{z^3-3z^2+4z+1}$; $ROC|z|>1$. 7

Unit-IV

4. (a) Show that : 2

$$x(t)*\delta(t-t_0)=x(t-t_0)$$

(b) Compute the output $y(t)$ for a continuous time LTI

system whose impulse response $h(t)$ and the input $x(t)$ are given by : 7

$$h(t)=e^{-\alpha t}u(t)$$

$$x(t)=e^{\alpha t}u(-t) \text{ for } \alpha>0$$

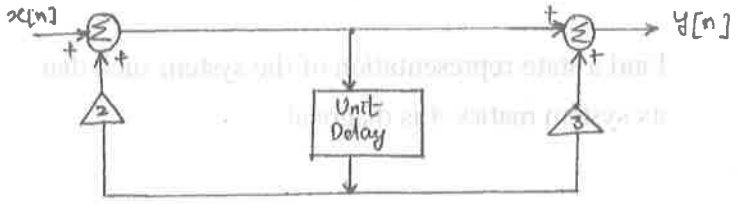
(c) Consider a continuous time LTI system described by : 7

$$y(t)=T\{x(t)\}=\frac{1}{T}\int_{t-T/2}^{t+T/2}x(\tau)\,d\tau$$

(i) Find and sketch the impulse response $h(t)$ at the system

(ii) Is this system causal?

(d) Consider the discrete time system. Write a difference equation that relates the output $y[n]$. 7



Unit-V

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

(b) Find the state equation of a discrete time system described by 7

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

(c) A continuous time LTI system is described by the following euqation, fine the state equation of the system. 7

$$\ddot{y}(t)+3\dot{y}(t)+2y(t)=4\dot{x}(t)+x(t)$$

(d) Consider a discrete time LTI system with system function. 7

$$H(z)=\frac{z}{2z^2-3z+1}=\frac{z}{2(z-1)\left(z-\frac{1}{2}\right)}$$

Find a state representation of the system such that its system matirx A is diagonal.