B.E. / B.Tech. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-IV

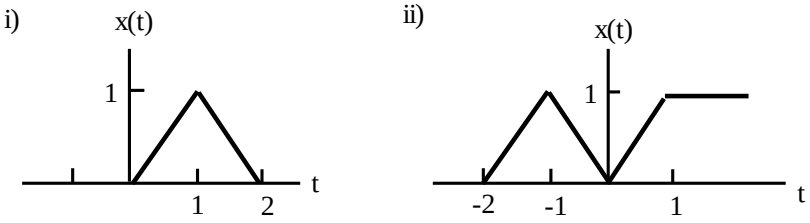
SE205 - Signals & Systems

P. Pages : 2 **GUG/S/25/13860**

Time : Three Hours * 2 2 9 5 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Determine and sketch the even and odd parts of the signals depicted in Figure. Label your sketches carefully. **8**



b) Determine whether the following system is linear, stable, causal and time-invariant using appropriate tests: **8**

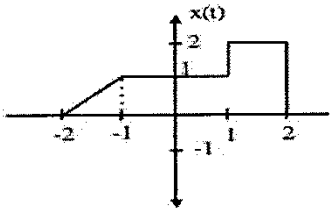
$y(n) = nx(n) + x(n+2) + y(n-2)$

OR

2. a) Sketch the signal $x(t) = e^{-a|t|}$; $a > 0$ Also determine whether the given signal is an energy signal or power signal. **8**

b) A continuous time signal x(t) is shown in fig. Sketch the following signals: **8**

i) $x(2t-1)$
ii) $x(2-t)$
iii) $x(t+4)$
iv) $x(3-t)$



3. a) Explain the following **8**
i) Linear time invariant system
ii) Impulse response of system
iii) Step response of the system

b) Find convolution using graphical method. **8**

$x(n) = \{1, 1, -1\}$; $h(n) = \{1, 2, 3\}$

OR

4. a) Given $x(n) = \delta(n) + 2\delta(n-1) - \delta(n-3)$ and $h(n) = 2\delta(n+1) + 2\delta(n-1)$ Compute and plot each of the following convolutions: **8**

i) $y_1(n) = x(n) * h(n)$
ii) $y_2(n) = x(n+2) * h(n)$
iii) $y_3(n) = x(n) * h(n+2)$

b) Explain any four the properties of LTI system along with block diagram. Determine whether the impulse response $h(n)=\left(\frac{1}{5}\right)^n u(n)$ is causal and /or stable. **8**

5. a) Find the Fourier transform of exponential signal $x(t)=e^{at}u(-t)$ also plot its magnitude and phase spectrum. **8**

b) i) Find the Fourier transform of $x(t)=\sin(\omega_0 t)$ **8**

ii) Obtain DFT of discrete time signal x(n), = {2, 1, 3, 2}

OR

6. a) Prove the following properties of exponential Fourier series. **8**

i) Time Reversal ii) Time Differentiation

b) State and Prove Parseval's theorem of Fourier transform. **8**

7. a) Prove frequency shifting property of Laplace transform. Using the property find the Laplace transform of $\cos(\omega_0 t)$. **8**

b) Find the z-transform of the signal $x(n)=\{2,-1,\underset{\uparrow}{3},2,0,1\}$ and find its RoC. Write the properties of z-transform. **8**

OR

8. a) Find the inverse Laplace transform of: **8**

i) $X(s)=\frac{3s+4}{(s+1)(s+2)^2}$ ii) $X(s)=\frac{s^2+s-3}{s^2+3s+2}$

b) Determine the z-transform of the following signals along with RoC: **8**

i) $x_1(n)=\left(\frac{2}{3}\right)^n u(n)+\left(-\frac{1}{2}\right)^n u(n)$ ii) $x_2(n)=a^{|n|};\ |a|<1$

9. a) Explain signal reconstruction using zero order hold. Also find its transfer function. **8**

b) Consider the analog signal **8**

$x_a(t)=3\cos(2000\pi t)+5\sin(6000\pi t)+10\cos(12000\pi t)$

i) What is the Nyquist rate for this signal.

ii) Assume now that we sample this signal using a sampling rate Fs = 5000 sample/s. What is the discrete-time signal obtained after sampling?

OR

10. a) Explain impulse train sampling with neat diagrams and mathematical expressions. **8**

b) Describe any one method of reconstruction of continuous time signal from its equivalent discrete time signal. **8**

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