

2023
B.E. (Electrical and Electronics Engineering)
Sixth Semester
EE-612: Signal and System

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

Q.No.1 (i) What is dirac delta function?

(ii) What do you mean by convolution sum and convolution integral?

(iii) Write down Parseval's relation for continuous time periodic signal and proof it.

(iv) Find Fourier transform of $x(n) = 1$.

(v) What is Hilbert transform? Mention its properties. (5x2=10)

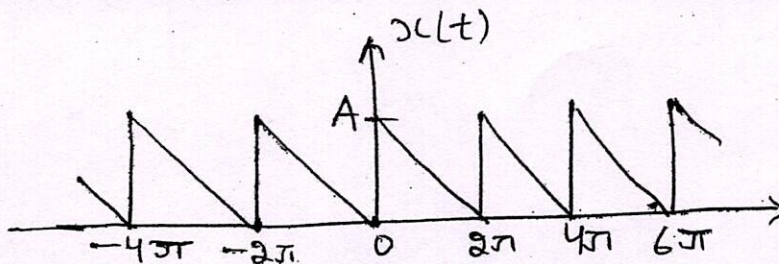
Part- A

Q.No. 2 (a) For the system described by the following equations, with the input $x(t)$ and output $y(t)$, determine which of the systems are linear and which are non-linear:

(i) $dy(t)/dt + 3y(t) = x(t)$ (ii) $dy(t)/dt + 2y(t) = x^2(t)$ (iii) $dy(t)/dt + 3y(t) + 4 = x(t)$

(b) What do you mean by transformation of independent variable? (6, 4)

Q.No.3 (a) Find the trigonometric Fourier series for the sawtooth wave shown below:



(b) Find the discrete time Fourier series for $x(n) = \cos(n\pi/4 + \phi)$. (5, 5)

Q. No.4 (a) Find the Fourier transform for $u(t)$.

(b) Find the time domain signal if its Fourier transform is

$$H(j\omega) = \begin{cases} 1, & 0 \leq |\omega| \leq \omega_0 \\ 0, & \text{otherwise} \end{cases}$$

(c) Mention any four properties of continuous time Fourier transform.

(3, 4, 3)

P.T.O.

(2)

Part-B

Q.No.5 (a) Determine the Fourier coefficients for the periodic sequence $x(n) = \{0, 1, 2, 3\}$, with period $N = 4$.

(b) Find Hilbert transform of $\cos\omega_0 t$. (6, 4)

Q.No.6 (a) Find the inverse Laplace transform of the following $X(s)$:

(i) $X(s) = (2s+4)/(s^2+4s+3)$, $\text{Re}(s) > -1$

(ii) $X(s) = (2s+4)/(s^2+4s+3)$, $\text{Re}(s) < -3$

(iii) $X(s) = (2s+4)/(s^2+4s+3)$, $-3 < \text{Re}(s) < -1$

(b) Find the initial and final values of $X(s) = (2s+5)/((s+1)(s+2))$, ROC: $\text{Re}(s) > -1$. (6, 4)

Q.No.7 (a) Find the inverse Z-transform of $\frac{1 - \frac{1}{2}z^{-1}}{1 - \frac{1}{4}z^{-2}}$, $|z| > \frac{1}{2}$ using long division method.

(b) Find the Z-transform of $x(n) = -a^n u(-n-1)$ for $|a| < 1$, and $|a| > 1$. (5, 5)