

* Fourier Transform:

1. Find the Fourier Integral Representation of $f(x) = \begin{cases} 1, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$

2. Find Fourier Cosine Integral Representation of

$$f(x) = \begin{cases} x^2, & 0 < x < a \\ 0, & x > a \end{cases}$$

3. Find Fourier Transform of $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$

4. Find Fourier Transform of $f(x) = \begin{cases} 1-x^2, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$

5. Find FCT of $f(x) = e^{-x} + e^{-2x}; x > 0$

6. Find FST and FCT of $f(x) = \begin{cases} x, & 0 \leq x < 1 \\ 2-x, & 1 \leq x < 2 \\ 0, & x > 2 \end{cases}$

7. Solve the integral eqn.

a) $\int_0^{\infty} f(x) \sin \lambda x \, dx = \begin{cases} 1-\lambda, & 0 < \lambda < 1 \\ 0, & \lambda \geq 1 \end{cases}$

b) $\int_0^{\infty} f(x) \sin \lambda x \, dx = \begin{cases} 1, & 0 \leq \lambda \leq 1 \\ 2, & 1 \leq \lambda \leq 2 \\ 0, & \lambda > 2 \end{cases}$

c) $\int_0^{\infty} f(x) \cos \lambda x \, dx = e^{-\lambda}, \lambda > 0$

* Applications of Z-Transform:

1. Solve the following difference eqn.

a) $f(k+2) - 4f(k) = 0; k \geq 0$

$$f(0) = 0$$

$$f(1) = 2$$

b) $f(k+1) + \frac{1}{2}f(k) = \left(\frac{1}{2}\right)^k; k \geq 0$

$$f(0) = 0$$

c) $12f(k+2) - 7f(k+1) + f(k) = 0; k \geq 0$

$$f(0) = 0, f(1) = 3$$

d) $f(k+2) + 3f(k+1) + 2f(k) = 0; k \geq 0$
 $f(0) = 0, f(1) = 1$

* Inverse Z-Transform:

Q: Find z^{-1} of;

1. $\frac{1}{(z-3)(z-2)}$ if $2 < |z| < 3$

2. $\frac{z^2}{(z-\frac{1}{4})(z-\frac{1}{5})}$ if $\frac{1}{5} < |z| < \frac{1}{4}$

$$3. \frac{z^3}{(z-3)(z-2)^2} ; |z| > 3.$$

$$4. \frac{z^3}{(z-1)(z-\frac{1}{2})^2} ; |z| > 1.$$

$$5. \frac{z^2}{(z-\frac{1}{2})(z-\frac{1}{3})} \text{ if } |z| > \frac{1}{2}$$

$$6. \frac{z}{(z-1)(z-\frac{1}{2})} \text{ if } |z| \geq 2.$$