



(An Autonomous Institution)

Coimbatore – 35

DEPARTMENT OF MATHEMATICS UNIT-II FOURIER TRANSFORM

SINE TRANSFORM : The Toucier sine transform q a function fim, orne a is defined as $F_s(s) = F_s[r_q(n)] = \sqrt{\frac{2}{\pi}} \int \varphi(n) \sin n dn$ The Inverse fourier sine transform of Fs(s) is defined as $f(m) = F^{-1}(F_s(s)) = \sqrt{\frac{2}{m}} \int F_s(s) smsn ds$. passeval's Identity . of Fiss & The Fourier transform of find then S [f(n)]² dn = S [Fs(s)]² ds. COSINE JRANSFORM The fource conne teansform & a function fin, orn < 2 is defined as Fers) = ferzen]= V= Jen cossnah The Inverse Fourier come transform of Fc (s) is defined as find = F- [Fersi] = VA S. Fers) as sonds. If FISS & The Founder Hearspoon of fins then parsetal's Identity is Jorg(n) dn= S[Fc(S)]²ds





(An Autonomous Institution)

Coimbatore – 35

DEPARTMENT OF MATHEMATICS UNIT-II FOURIER TRANSFORM

4) Find the fourier cosine transform of $f(n) = \int \cos n$, if $\partial \cos \alpha$ soln: What $Fe(\theta) = \sqrt{\frac{1}{27}} \int \frac{\partial}{\partial \pi} \int \cos n \cdot \cos n \, dn$ $= \sqrt{\frac{2}{17}} \int \frac{\partial}{\partial x} \cos n \cdot \cos n \, dn$ $= \sqrt{\frac{2}{17}} \int \int \frac{\partial}{\partial x} (3+1) n + \cos (3-1)n \int dn$ $= \frac{1}{\sqrt{\frac{2}{271}}} \int \int \frac{\partial}{\partial x} (3+1) n + \cos (3-1)n \int dn$ $= \frac{1}{\sqrt{\frac{2}{271}}} \int \frac{\partial}{\partial x} (3+1) n + \cos (3-1)n \int dn$

5> Find The fourier sine & cosine transform q e-an and deduce that inverse fourier transform & paeseral's columnity soto:

Whit Fis (s) =
$$\sqrt{\frac{2}{11}} \int \frac{2}{3} (n) \sin sn dn$$

= $\sqrt{\frac{2}{11}} \int \frac{2}{5} e^{-an} \sin sn dn$
= $\sqrt{\frac{2}{11}} \left[\frac{s}{s^2 + a^2} \right]$

19MAT201/Transforms & Partial Differential EquationsS.Sindhuja/Ap/Maths/SNSCTPage -2 of 5



(An Autonomous Institution)



Coimbatore – 35

DEPARTMENT OF MATHEMATICS UNIT-II FOURIER TRANSFORM

$$\frac{\operatorname{Graverse Transform:}}{\operatorname{Whit}} = F^{-1}[F_{s}(s)] = \sqrt{\frac{\alpha}{\pi}} \int_{0}^{\infty} F_{s}(s) g_{0}^{s} g_{0} ds$$

$$= \sqrt{\frac{\alpha}{\pi}} \int_{0}^{\infty} \sqrt{\frac{\alpha}{\pi}} \frac{g}{g_{1}^{2} + \alpha^{2}} g_{0}^{s} g_{0}^{s} g_{0} ds$$

$$= \sqrt{\frac{\alpha}{\pi}} \int_{0}^{\infty} \sqrt{\frac{\alpha}{\pi}} \frac{g}{g_{1}^{2} + \alpha^{2}} g_{0}^{s} g_{1}^{s} g_{1}^{s}$$



(An Autonomous Institution)



Coimbatore – 35

DEPARTMENT OF MATHEMATICS UNIT-II FOURIER TRANSFORM

Cosine Wansform:
Whit
$$F_c(s) = \sqrt{\frac{2}{11}} \int_{0}^{\infty} \frac{8}{3}(n) \cos sn dn$$

 $= \sqrt{\frac{2}{11}} \int_{0}^{\infty} \frac{8}{2}(n) \cos sn dn$
 $= \sqrt{\frac{2}{11}} \int_{0}^{\infty} \frac{2}{3}(n) \cos sn dn$

Priverie Transform!
When
$$\overline{f}(n) = F^{-1}[F_{c}(s)] = \sqrt{\frac{2}{11}} \int_{0}^{\infty} F_{c}(s) \cos sn ds$$

 $\overline{f}(n) = \sqrt{\frac{2}{11}} \int_{0}^{\infty} \frac{a}{s^{2}a^{2}} \int \cos sn ds$
 $e^{-\alpha n} = \sqrt{\frac{2}{11}} \int_{0}^{\infty} \frac{a}{s^{2}+a^{2}} \cos sn ds$
 $put n = 0$
 $1 = \frac{2}{11} \int_{0}^{\infty} \frac{a}{s^{2}+a^{2}} \cos s(s) ds$
 $\overline{T}_{2} = \int_{0}^{\infty} \frac{a}{s^{2}+a^{2}} ds$.



(An Autonomous Institution)



Coimbatore – 35

DEPARTMENT OF MATHEMATICS UNIT-II FOURIER TRANSFORM

Parseval's edentity:
What
$$\int_{0}^{\infty} [f(n)]^{2} dn = \int_{0}^{\infty} [F_{c}(s)]^{2} ds$$

 $\int_{0}^{\infty} [e^{-\alpha n}]^{2} dn = \int_{0}^{\infty} \left[\sqrt{\frac{2}{n!}} \frac{\alpha}{s^{2}+\alpha^{2}}\right]^{2} ds$
 $\int_{0}^{\infty} e^{-2\alpha n} dn = \frac{2}{n!} \int_{0}^{\infty} \frac{(\alpha - \alpha)^{2}}{(s^{2}+\alpha^{2})^{2}} ds$
 $\frac{e^{-2\alpha n}}{2\alpha} \int_{0}^{\infty} \frac{1}{2\alpha} = \frac{2}{n!} \int_{0}^{\infty} \frac{(\alpha - \alpha)^{2}}{(s^{2}+\alpha^{2})^{2}} ds$
 $\frac{1}{2\alpha} = \int_{0}^{\infty} \left[\frac{\alpha}{s^{2}+\alpha^{2}}\right]^{2} ds$
 $\frac{1}{2\alpha} = \int_{0}^{\infty} \left[\frac{\alpha}{s^{2}+\alpha^{2}}\right]^{2} ds$.

19MAT201/Transforms & Partial Differential EquationsS.Sindhuja/Ap/Maths/SNSCTPage -5 of 5