Course Code: 4MSCM2
Course: Integral Transform-II
Credit: 4
Last Submission Date: October 31, (for January session)
April 30 (for July Session)

Max. Marks:-70
Min. Marks:-25

Note:-attempt all questions.

Que.1 Using the Fourier sine transform, solve the partial differential equation $\frac{\partial v}{\partial t} = k\frac{\partial^2 v}{\partial x^2}$ for x > 0 , t > 0 , under the boundary conditions V = v 0 when x = 0, t > 0 and the initial condition v = 0, when t= 0 , x > 0 .

Que.2 Use finite Fourier transforms to solve

$$\frac{\partial U}{\partial t} = \frac{\partial^2 U}{\partial x^2}$$

U (0 , t) = 0 , U(4 , t) = 0 , U(x , 0) = 2x , where 0< x < 4 , t < (0).

Que.3 Find the Hankel transform of $x^{-2}e^{-x}$ taking $x\,^{J}1$ (px) as the kernel.

Que.4 Find $H^{-1}\{P^{-2}\ e^{-ap}\}$, taking n = 1.

Que.5 State & Prove Parseval's theorem.

Que.6 $Hn\left(\frac{df}{dx}\right) = \int_0^a \frac{df}{dx}$,x Jn (px) dx , where p is the root of the equation $Jn\ (pa) = 0$.

Que.7 Prove that the finite. Hankel transform of f(x) ,$0 \le x \le 1$ is $P^{n-m}\, Jn\ (p)$, where

$$f\ (x) = \frac{2^{1+n-m}}{\sqrt{(m-n}}\ (x^n\ (1 - x^2)^{m-n-1})$$

Que.8 Find the potential V (r , z) of a field due to a flat circular disc of radius with the centre of the origin and axis along the Z = axis, satisfying the differential equation

$$\frac{\partial^2 v}{\partial r^2} + \frac{1}{r}\frac{\partial v}{\partial r} + \frac{\partial^2 v}{\partial z^2} = 0\ , 0\ \le r < \infty\ , z \ge\ 0$$ and the boundary conditions

$v = v(0)$ when $z = 0, 0\ \le r\ \le 1$ and $\frac{\partial v}{\partial z} = 0$ when $z = 0\ ,\ r > 1$.

Que.9 State & Prove Mellin Inversion theorem.

Que.10 Find M {Sinx}