DIFFERENTIAL EQUATIONS AND TRANSFORMS (BMAT102L)
(WINTER SEMESTER 2021-2022)

MODULE – 6 - FOURIER TRANSFORM

TUTORIAL SHEET - 2

1. Find the Fourier cosine transform of $2e^{-5x} + 5e^{-2x}$.
2. Obtain Fourier Sine transform of $e^{-2x} + 4e^{-3x}$.
3. Find $f(x)$, if its Fourier Sine transform is $\frac{s}{s^2+1}$.
4. If $\int_0^\infty f(x) cossxdx = \frac{sins}{s}$, find $f(x)$.
5. Using Parseval's identity for Fourier Cosine and Sine Transforms, evaluate $\int_0^\infty \frac{x^2dx}{(x^2+4)^2}$.
6. Given $f(x) = e^{-ax}, x \geq 0$, verify Parseval's identity for Fourier transforms.
7. Use appropriate transform to evaluate
   $(i) \frac{dx}{(x^2+2^2)(x^2+3^2)}$
   $(ii) \frac{x^2dx}{(x^2+64)(x^2+49)}$.
8. Find the Fourier Cosine transform of e^{-ax} and use it to find the Fourier transform of $e^{-a|x|}cosbx$.
9. Find Fourier Sine transform of e^{-3x} and hence find $F_c(xe^{-3x})$.
10. By finding the Fourier cosine transform of $F_C\left(e^{-a^2x^2}\right)$, compute $F_S\left(xe^{-a^{2x^2}}\right)$.
11. Solve the heat conduction problem described by
    PDE: $k\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}, 0 < x < \infty, t > 0$
    BC: $u(0,t) = u_0, t \geq 0$
    IC: $u(x,0) = 0, 0 < x < \infty$
    u and $\frac{\partial u}{\partial x}$, both tend to zero as $x \to \infty$.