SRM Institute of Science and Technology
College of Engineering and Technology
Department of Mathematics
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

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Course Code &Title: 18MAB201T-Transforms and Boundary Value Problems

Year &Sem: II/III , Unit: IV

Tutorial 1

Part A

1	Define infinite complex Fourier transform of $f(x)$ and write its inversion formula.
2	Write down the corresponding Kernels in the above formulas.
3	State the Fourier integral theorem.
4.	If $F[f(x)] = F(s), F[g(x)] = G(s)$ then show that $F[a.f(x) + b.g(x)] = a.F(s) + b.G(s)$
5.	If $F[f(x)] = F(s)$ then find the expressions for $F[f(x-a)], F[f(a.x)], F\left[e^{iax}f(x)\right]$ and $F[f(x)\cos(ax)]$ in terms of $F(s)$.

Part B

6.	Find the Fourier transform of $$f(x) = \begin{cases} x, |x| \geq a \\ 0, |x| > a \end{cases}.$$
7.	Find the Fourier transform of $e^{-\frac{x^2}{2}}$ by finding the Fourier transform of $e^{-\frac{a^2x^2}{2}}$.
8.	Find the Fourier transform of $$f(x) = \begin{cases} e^{ikx}, & a < x < b \\ 0, & x < a, y > b \end{cases}$$ And hence deduce the Fourier transform of $$f(x) = \begin{cases} 1, & a < x < b \\ 0, & x < a, y > b \end{cases}.$$
9.	Find the Fourier transform of $$f(x) = \begin{cases} 1 - x^2, |x| < 1 \\ 0, |x| > 1 \end{cases}$$ And hence evaluate $$\int_0^\infty \left(\frac{x\cos(x) - \sin(x)}{x^3}\right) cos\left(\frac{x}{2}\right) dx.$$
10.	Find the Fourier transform of $$f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a > 0 \end{cases}$$ And hence evaluate the values of $$\int_0^\infty \frac{sin(z)}{z} dz \, , \int_{-\infty}^\infty \frac{sin(as)cos(sx)}{s} ds.$$