Department of Mathematics, NIT, Jamshedpur

Home Assignment: Set -1

Autumn Semester 2020-2021

Class: B. Tech(H). ; Semester- Third; Branch: Electronics and Communication Engg.

Subject: Engineering Mathematics-III, Subject Code: MA 1301

(Symbols have their own usual significance)

1. Find the Laplace transform of: (i) $\sin^3 2t$ (ii) $te^{-t}\sin 3t$
2. Evaluate $\int_0^\infty t\, e^{-2t}\, sin\, t\, dt$, using Laplace transform.
3. Find $L\{\frac{e^{-at}-e^{-bt}}{t}\}$
4. Evaluate $L^{-1}\{(6s^2 + 22s + 18)/(s^3 + 6s^2 + 11s + 6)\}$
5. Apply Convolution to evaluate
   (i) $L^{-1}\{1/[s(s^2 + a^2)]\}$, (ii) $L^{-1}\{1/[(s^2 + 1)(s^2 + 9)]\}$
   (ii) $L^{-1}\{1/[(s - 1)(s + 2)]\}$, (iv) $L^{-1}\{s^2/(s^2 + 4)^2\}$
6. Find the Laplace transform of the periodic function(saw tooth wave)
   $f(t) = [(kt)/t]$ for $0 < t < T$, $f(t + T) = f(t)$

7. Obtain Laplace transform of rectangular wave given by
   $$L\{f(t)\} = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t)dt$$
8. Solve $\frac{d^2y}{dt^2} + y = t\, Cos\, 2t$, where $y = 0, (dy/dt) = 0$, when $t = 0$,
   using Laplace transform method.
9. Solve $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = Cos\, 2t$, where $y = 2, (dy/dt) = 1$, when $t = 0$,
   using Laplace transform method.

10. Find the Fourier Series for $f(x) = x \sin x$ in the interval $-\pi < x < \pi$

11. Find the Fourier series expansion for $\sin ax$ in the interval $-\pi < x < \pi$

12. Find the Fourier series to represent $x - x^2$ from $x = -\pi$ to $x = \pi$

13. Expand $f(x) = e^{-x}$ as Fourier series in the interval $(-l, l)$

14. Obtain Fourier series for the function $f(x)$ given by
    $f(x) = 1 + (2x/\pi)$, $\pi \le x \le 0$
    $= 1 - (2x/\pi)$, $0 \le x \le \pi$
15. Expand $f(x) = \frac{1}{4} - x,\ if\ 0 < x < \frac{1}{2}$
    $= x - \frac{3}{4}, if\ \frac{1}{2} < x < 1$
16. Find the complex Fourier series of $f(x) = e^x$, if $-\pi < x < \pi$ and $f(x + 2\pi) = f(x)$

(S. Jha)