

## Module-1

1) Find Laplace transform of

i)  $t e^{-t} \sin at + \frac{\cos 2t \cos 3t}{t}$  ii)  $\frac{(a^2-1)^2}{2b}$

iii)  $\frac{s}{s^2+6s+13}$  iv)  $\cosh^2 at / \sinh^2 at$

v)  $\sin t \sin 2t \sin 3t / \cos t \cos 2t \cos 3t$

vi)  $\frac{t-e^t}{t}$  vii)  $e^{-3t} \sin 5t \cos 3t$  viii)  $(t+2)^2$

2) Find  $L\left[\frac{e^{-t} \sin t}{t}\right]$  and deduce  $\int_0^{\infty} \frac{e^{-t} \sin t}{t} dt = \frac{\pi}{4}$

3) Convolution theorem

i)  $\frac{1}{(s^2+1)(s^2+9)}$  ii)  $\frac{s}{(s^2+a^2)^2}$

iii)  $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$  iv)  $\frac{1}{s^2(s+1)^2}$

4) Inverse Laplace

i)  $\frac{(s^2-1)^2}{s^5}$  ii)  $\frac{s}{s^2+6s+13}$  iii)  $\frac{7s+9}{4s^2+4s+9}$

iv)  $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$

## Unit Step Function

$$1) f(t) = \begin{cases} \cos t & 0 \leq t < \pi \\ \cos 2t & \pi \leq t < 2\pi \\ \cos 3t, & t \geq 2\pi \end{cases}$$

$$2) f(t) = \begin{cases} t^2 & 0 \leq t < 2 \\ 4t & 2 \leq t < 4 \\ 8 & t \geq 4 \end{cases}$$

$$3) f(t) = \begin{cases} 1, & 0 \leq t < 1 \\ 2t, & 1 \leq t < 2 \\ 3t, & 2 \leq t < 3 \end{cases}$$

6) find Laplace transform of a wave  
period of  $2a$

$$f(t) = \begin{cases} t & 0 \leq t < a \\ 2a - t, & a \leq t < 2a \end{cases}$$

7) Laplace transform of derivative

$$i) y''(t) + 5y'(t) + 6y(t) = 5e^{2t}, \quad y(0) = 2, \quad y'(0) = 1$$

$$ii) y'' - 3y' + 2y = e^{3t}, \quad y(0) = 1, \quad y'(0) = -1$$