	**Parul University** Faculty of Engineering & Technology Department of Applied Sciences and Humanities 1st Year B.Tech Programme (All Branches) Mathematics-II (303191151)

Tutorial-2 Laplace Transform

Q-1. Find the Laplace Transforms of the following functions:

1. $\cos^2 3t$
2. $e^{2t}(cos2t + sin4t)$
3. $\frac{sin3tcos2t}{t}$
4. $te^{-2t}sin3t$
5. $t^2 + 2t^{3/2} + \cos \pi t$

Q-2. Find the inverse Laplace transform of following:

1. $\frac{3s-2}{(s^2+3s+2)}$
2. $\frac{s+2}{s^2-4s+13}$
3. $\log\left(\frac{s+a}{s+b}\right)$
4. $\frac{(s^2-1)^2}{s^5}$
5. $\frac{5s+3}{(s-1)(s^2+2s+5)}$

Q-3 (i) Find the Laplace Transform of the following Piecewise continuous functions

$$f(t) = \begin{cases} t & 0 \le t < 1 \\ 2-t & 1 \le t < 2 \\ 0 & t \ge 2 \end{cases}$$

(ii) Find Laplace Transform of the following periodic function defined by

$$f(t) = \begin{cases} Sin\omega t \ \ if \ 0 < t < \dfrac{\pi}{\omega} \\ 0 \quad if \ \ \dfrac{\pi}{\omega} < t < \dfrac{2\pi}{\omega} \end{cases}$$

Where $f\left(t + \frac{2\pi}{\omega}\right) = f(t)$

Q-4 Using convolution theorem, find (a) $L^{-1}\left\{\frac{1}{s^2(s-1)}\right\}$ (b) $L^{-1}\left\{\frac{1}{s(s^2+a^2)}\right\}$

Q-5 Evaluate the following using second shifting theorem:

(a) $L(e^{4t}u(t-3))$ (b) $L(sint\ u(t-1))$

(c) $L^{-1}\left(\frac{se^{-3s}}{s^2+16}\right)$ (d) $L^{-1}\left(\frac{3e^{-\pi s}}{s^2+25}\right)$

Q-6 Solve the following IVP using Laplace transform:

1. $\frac{d^2y}{dt^2} - 6\frac{dy}{dt} + 9y = t^2e^{3t}, y(0) = 2, y'(0) = 6.$
2. $y' - 4y = 2e^{2t} + e^{4t}, y(0) = 0$

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