Ex-1 Find Laplace transform of following:

(1) $f(t) = 5t^2 + 3t^2 - 6t + 3e^{-5t}$.

(2) $f(t) = e^{2t}(\cosh^2 at)$. (3) $L(\sin^3 t)$ (4) $L(\sinh 3t \cdot e^{2t})$

Ex-2 Find $L\{f(t)\}$, where $f(t) = |t-1| + |t+1|$, $t \geq 0$.

Ex-3 Use first shifting property,evaluate the Laplace transforms of following:

(1) $e^{-at} \sin bt$,

(2) $e^{3t} \sin^2 t$,

(3) $e^{4t} \sin 2t \cos t$.

Ex-4 Evaluate the Laplace transforms of following:

(a) $\sin at + at \cos at$,

(b) $\left[(e^{-bt} - e^{-at})\frac{1}{t}\right]$,

(c) $\frac{(1-e^t)}{t}$. (d) $L\left(\frac{\sinh at}{t}\right)$ (e) $L\left(\frac{e^t \cosh t \sinh 2t}{t}\right)$, (f) $L\left(\int_0^t \frac{e^t \sin t}{t} dt\right)$

Ex-5 Find the inverse Laplace of following :

(a) $\frac{1}{(s-\sqrt{2})(s-\sqrt{3})}$. (b) $\frac{3}{s^2+6s+18}$.   (c) $\frac{se^{-2s}}{s^2+\pi^2}$. (d) $-\frac{s+10}{s^2-s-2}$.

(e) $\frac{s^3+2s^2+2}{s^3(s^2+1)}$. (f) $\ln\left(\frac{s^2+9}{(s+2)^2}\right)$ (g) $\frac{s+1}{s^2(s+2)}$ (h) $\frac{s-2}{(s+1)^3(s+2)}$

Ex-6 Solve the following equations using Laplace transform :

(1) $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 5x = e^{-t} \sin t, x(0) = 0, x'(0) = 1$.

(2) $y'' - 3y' + 2y = 4t + e^{3t}, when \ y(0) = 1 \ \& \ y'(0) = -1$.

(3) $y'' - 3y' + 2y = 12e^{-2t}, y(0) = 2, y'(0) = 6$.

Ex-7 Using convolution theorem ,find the inverse transform of

(1) $\frac{1}{s(s^2+a^2)}$. (2) $\frac{1}{(s^2+a^2)^2}$ (3) $\frac{s}{(s^2+a^2)^2}$.

Ex-8 Find the Laplace transform of

(1) $L\{\delta(t-3)\}$ (2) $L\{t\delta(t-2)+t^2u(t-2)\}$ (3) $L\{\sinh 2t\delta(t-2)+\cosh 2tu(t-2)\}$

Ex-9 Find the Laplace transform of $f(t) = \frac{k}{p}t; 0 < t < p$ and $f(t+p) = f(t)$.

****