

# ENGINEERING ANALYSIS

## LAPLACE TRANSFORMS

### TUTORIAL 4

1. Determine the Laplace transforms of the following functions:

(a)  $\sin 3t$                       (b)  $\cos 2t$                       (c)  $e^{4t}$                       (d)  $6t^2$   
(e)  $t^2 - 3t + 4$                       (f)  $e^{3t} \cos 4t$

2. Find the inverse transform of the following:

(a)  $\frac{1}{2s - 3}$                       (b)  $\frac{5}{(s - 4)^2}$                       (c)  $\frac{3s + 4}{s^2 + 9}$

3. Express in partial fractions:

(a)  $\frac{22s + 16}{(s + 1)(s - 2)(s + 3)}$                       (b)  $\frac{s^2 - 11s + 6}{(s + 1)(s - 2)^2}$

4. Determine:

(a)  $\left\{ \frac{4s^2 - 17s - 24}{s(s + 3)(s - 4)} \right\}$                       (b)  $\left\{ \frac{5s^2 - 4s - 7}{(s - 3)(s^2 + 4)} \right\}$

5. Solve the following equations by Laplace transforms.

(a)  $x + 3x = e^{-2t}$                       given that  $x = 2$  when  $t = 0$ .  
(b)  $3x - 6x = \sin 2t$                       given that  $x = 1$  when  $t = 0$ .  
(c)  $x - 7x + 12x = 2$                       given that at  $t = 0$ ,  $x = 1$  and  $x = 5$   
(d)  $x - 2x + x = t e^t$                       given that at  $t = 0$ ,  $x = 1$  and  $x = 0$ .