BRAC University
MAT-215
Practice Sheet # 6

1. Find the Laplace transformation of each of the following function:

$(i)\ 3e^{-2t}$ $(ii)\ 4t^3 - e^{-t}$ $(iii)\ 7\sin 2t - 3\cos 2t$ $(iv)\ (t^2+1)^2$ $(v)\ (4e^{2t}-2)^3$.

2. Evaluate each of the following:

$(i)\ \mathcal{L}\{t^3 e^{-3t}\}$ $(ii)\ \mathcal{L}\{5e^{3t}\sin 4t\}$ $(iii)\ \mathcal{L}\{(t+2)^2 e^t\}$ $(iv)\ \mathcal{L}\{e^{-t}(3\sinh 2t - 5\cosh 2t)\}$

$(v)\ \mathcal{L}\{e^{-4t}\cosh 2t\}$ $(iv)\ \mathcal{L}\{e^{2t}(3\sin 4t - 4\cos 4t)\}$.

3. Determine each of the following:

$(i)\ \mathcal{L}^{-1}\left\{\dfrac{12}{4-3s}\right\}$ $(ii)\ \mathcal{L}^{-1}\left\{\dfrac{2s-5}{s^2-9}\right\}$ $(iii)\ \mathcal{L}^{-1}\left\{\dfrac{23s-15}{s^2+8}\right\}$ $(iv)\ \mathcal{L}^{-1}\left\{\dfrac{1}{s^{3/2}}\right\}$

$(v)\ \mathcal{L}^{-1}\left\{\dfrac{s+1}{s^{4/3}}\right\}$ $(vi)\ \mathcal{L}^{-1}\left\{\dfrac{1}{s^4}\right\}$ $(vii)\ \mathcal{L}^{-1}\left\{\dfrac{1}{\sqrt{2s+3}}\right\}$.

4. Evaluate each of the following using partial fraction:

$(i)\ \mathcal{L}^{-1}\left\{\dfrac{6s-4}{s^2-4s+20}\right\}$ $(ii)\ \mathcal{L}^{-1}\left\{\dfrac{4s+12}{s^2+8s+16}\right\}$ $(iii)\ \mathcal{L}^{-1}\left\{\dfrac{2s^2-4}{(s+1)(s-2)(s-3)}\right\}$

$(iv)\ \mathcal{L}^{-1}\left\{\dfrac{5s^2-15s-11}{(s+1)(s-2)^3}\right\}$ $(v)\ \mathcal{L}^{-1}\left\{\dfrac{3s+1}{(s^2+1)(s-1)}\right\}$ $(vi)\ \mathcal{L}^{-1}\left\{\dfrac{2s^2-4}{(s+1)(s-2)(s-3)}\right\}$

$(vii)\ \mathcal{L}^{-1}\left\{\dfrac{s^2+2s+3}{(s^2+2s+2)(s^2+2s+5)}\right\}$.

5. Solve the given differential equation:

$(i)\ Y'' - 3Y' + 2Y = 4e^{2t},\quad Y(0) = -3,\ Y'(0) = 5$

$(ii)\ Y'' + 9Y = \cos 2t,\quad Y(0) = 1,\ Y(\pi/2) = -1$

$(iii)\ Y'' + 2Y' + 5Y = e^{-t}\sin t,\quad Y(0) = 0,\ Y'(0) = 1$

$(iii)\ Y''' - 3Y'' + 3Y' - Y = e^t t^2,\quad Y(0) = 0,\ Y'(0) = 0,\quad Y''(0) = -2.$