Differential Equations
Mid Term Examination - II (Summer- 2006)

MTH 2201

Duration: 1 hour

Max. Credit: 30 points

Answer all the questions. No credit will be given if only the answer is written without showing the relevant supporting work. Write legibly. The numbers at the end of each question indicate the maximum credit for the corresponding question.

1. Find the inverse Laplace transform of 
   \[ F(s) = \frac{1}{(s^2 + 1)^2}. \] [4]

2. Use Laplace transform method to solve the IVP
   
   \[ y'' + y = \sin t, \ y(0) = 1, \ y'(0) = -1. \] [4]

3. Solve the IVP \( y' + y = \delta(t - 1), \ y(0) = 2. \) [4]

4. Find the Laplace transform of \( \mathcal{L} \{(3t + 1)u(t - 3)\} \) where \( u(t - 3) \) is the unit step function. [5]

5. Solve the following system of Differential Equations:
   
   \[
   \begin{align*}
   x' &= 2y + e^t \\
   y' &= 8x - t
   \end{align*}
   \] [7]

6. Find the fundamental matrix of the following system:

   \[
   \begin{align*}
   y_1' &= y_3 \\
   y_2' &= y_2 \\
   y_3' &= y_1
   \end{align*}
   \] [6]