Important Note

Show all work.
Use of programmable calculator is not allowed.
Mobiles and paging devices should not be carried during examination.

Instructor: F. D. Zaman
Q1)(a) Determine if the following solutions of some differential equation are linearly independent on \((0, \infty)\)

\[ y_1 = x, \quad y_2 = x^{-2}, \quad y_3 = x^{-2} \ln x \]  

(2)
Q1)(b) If one solution of the following differential equation is \( y_1 = e^x \), find the second solution
\[
xy'' - (x + 1)y' + y = 0.
\]
Q 2) Solve the initial value problem
\[ y'' - 2y'' + y = 0 \]  
\[ y(0) = 0, y'(0) = 0, y''(0) = 1. \]
Q3) Solve the non-homogeneous differential equation

\[ y'' - 2y' + 2y = e^x \cos 2x. \] (4)
Q 4) Use variation of parameter method to solve the following

\[ x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + 4y = 2x^2. \]
Q5) Find a power series solution of the following

\[(x - 1)y'' - xy' = y = 0.\]