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
Q # 1(a) Find the Laplace transform of following 

(i) \( f(t) = te^{-2t} \sin 3t \)

(ii) \( f(t) = \cos 2t \mathcal{U}(t - \frac{\pi}{2}) \)
Q # 1(b) Find the inverse Laplace transform

\( F(s) = \frac{(1 + e^{-s})^2}{s^2(s - 1)} \)

\( \text{(ii) } F(s) = \frac{1}{s^2} \cdot \frac{1}{s + 1} \)
Q # 2) Solve the initial value problem

\[ y'' + 2y' + y = \delta(t - 2) \]

\[ y(0) = 0, \quad y'(0) = 0 \]
Q # 3) Find the Fourier series of $f(x)$ on $(-\pi, \pi)$

$$f(x) = \begin{cases} 
1, & -\pi < x < 0 \\
x, & 0 < x < \pi 
\end{cases}$$
Q # 4) Find half-range **Fourier sine and Fourier cosine** series in (0,1) of \( f(x) \)

\[ f(x) = e^{2x}. \]  

(5)