Q 1.(a) Describe Bromwich contour and the statement of theorem to find Laplace inverse transform of \( F(s), s > a \).

(b) Find Laplace inverse transforms using the Bromwich theorem

(i) \( F(s) = \frac{1}{(s - 2)^2(s + 4)} \)

(ii) \( F(s) = \frac{1}{s^3 + 1} \)

Q 2. Use branch line integral to find Laplace inverse transform of \( F(s) = s^{-1/2} \).

Q 3. Consider the model of heat dissipation in brakes

\[
a^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}, \quad 0 < x < L, \quad t > 0
\]

\[
\frac{\partial u}{\partial x}(0, t) = 0, \quad \frac{\partial u}{\partial x}(L, t) = 1, \quad t > 0
\]

\[
u(x, 0) = 0, \quad 0 < x < L
\]

Find \( u(x, t) \) using the Laplace transform and the residue theorem.