

Buckingham Π -theorem:

If an equation involving k variables is dimensionally homogeneous, it can be reduced to a relationship among $k - r$ independent dimensionless products, where r is the minimum number of reference dimensions required to describe the variables.

Criteria for the repeating variables:

1. The number of repeating variables is equal to the number of reference dimensions.
2. All the required reference dimensions must be included within the group of repeating variables.
3. Each repeating variable must be dimensionally independent of the others.

Moody chart is at the end of the exam

Material derivative

$$\frac{D\rho}{Dt} = \frac{\partial\rho}{\partial t} + \vec{V} \cdot \nabla\rho = \frac{\partial\rho}{\partial t} + \frac{\partial\rho}{\partial x}v + \frac{\partial\rho}{\partial y}w + \frac{\partial\rho}{\partial z}w$$

Continuity equation and Navier–Stokes equations will be given if they are required in the exam.