Equations you should know

The exam questions will assume that you know the following and what the parameters mean..

Mechanical characteristics

Water content by mass, termed moisture content $\Theta_m = \frac{m_w}{m_s}$

Porosity (total) $n = \frac{V_v}{V_t} = \frac{(V_w + V_a)}{V_t}$

Density of solids $\rho_s = \frac{m_s}{V_s}$ (average value for mineral soils 2.65 g/cm^3)

Dry bulk density of soil $\rho_b = \frac{m_s}{V_t}$ (sandy soils 1.6, clays 1.1 g/cm^3)

The weights are given in newtons/m^3 and the densities in grams or Kg/m^3.

Groundwater flow

$K = k \cdot \frac{\rho_w g}{\mu}$

$Q = AKi$

$T = Kb$

$S = b S_s$

$q = Ki$

$P = ET + Q \pm \Delta S$

Typical values of hydraulic conductivity in m/s

$K_x \frac{\partial^2 h}{\partial x^2} + K_y \frac{\partial^2 h}{\partial y^2} + K_z \frac{\partial^2 h}{\partial z^2} - Q = S_s \frac{\partial h}{\partial t}$ (not necessary to learn but you should know what its bits are)

Contaminant transport

$v_a = \frac{q}{n_e}$

$D_L = \alpha |v|$

$D = D_e + D_L$