

$$3) \rho_B = 2.12 \text{ g/cm}^3$$

$$S_w = 20\% \rightarrow S_g = 80\%$$

$$\rho_{gas} = 0.198/\text{cm}^3$$

$$\rho_{grain} = 0.4 \rho_{calc.} + 0.6 \rho_{ddom}$$

$$\rho_{grain} = 0.4(2.72) + 0.6(2.85)$$

$$(\rho_g = 2.798)$$

$$\rho_B = \phi (\rho_g S_g + \rho_w S_w) + (1-\phi) \rho_{grain}$$

$$2.12 = \phi [0.19 (0.8) + 1(0.2)] + (1-\phi)(2.798)$$

$$2.12 - 2.798 = \phi (0.352) - \phi (2.798)$$

$$\phi = 27.72\%$$