

### 3D2 Geotechnical Engineering II

- 1 (a)  $17.7 \text{ kN/m}^3$ ,  $21 \text{ kN/m}^3$ , assuming the unit weight of water is  $10 \text{ kN/m}^3$   
(b)  $\sigma = 39.8 \text{ kPa}$ ,  $\tau = 23.0 \text{ kPa}$ ,  $\phi_{\text{crit}} = 36^\circ$ ,  $\phi_{\text{peak}} = 44.7^\circ$   
(c)  $\sigma = 46.0 \text{ kPa}$ ,  $\tau = 26.6 \text{ kPa}$ ,  $u = 18.8 \text{ kPa}$ ,  $\sigma' = 27.2 \text{ kPa}$ ,  $\phi_{\text{crit}} = 36^\circ$ ,  $\phi_{\text{peak}} = 45.5^\circ$   
(d) –

- 2(a) (i)  $M = 0.9$ ,  $p_c = 153 \text{ kPa}$ , (ii)  $\kappa = 0.057$ , (iii) –  
(b)  $q_f = 54.3 \text{ kPa}$   
(c)  $p = 423 \text{ kPa}$

- 3 (a)  $\sigma_v' = 105 \text{ kPa}$ ,  $\sigma_h' = 84 \text{ kPa}$ ,  $\sigma_{v0}' = 210 \text{ kPa}$ ,  $\sigma_{h0}' = 126 \text{ kPa}$   
(b) (i)  $\Delta u$  at yield =  $13 \text{ kPa}$ ,  $\Delta u$  at ultimate failure =  $31 \text{ kPa}$   
(ii) –  
(iii) drained strength at failure =  $125 \text{ kPa}$

- 4(a) –  
(b)  $G = 37.8 \text{ MN/m}^2$   
(c)  $33 \text{ mm}$   
(d)  $6.6 \text{ mm}$