104 年度助理管理師/助理工程師、助理事務員甄試試題答案

師級：「類別二：工程」

科目：工程力學與土壤力學

一、選擇題

題號	標準答案
1	B
2	C
3	A
4	A
5	C
6	D
7	本題送分
8	D
9	B
10	B
11	C
12	C
13	A
14	B
15	C
16	D

二、計算題

1. 解：Engineering Mechanics(Statics), 12/e, R.C.Hibbeler, Chapter5

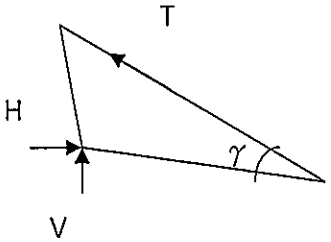
(A)首先求 γ

$$\frac{\sin\gamma}{0.8}=\frac{\sin 40}{2.0},\quad \gamma=\sin^{-1}0.2571=14.9°$$

$$\sum\tau=0$$

$$-3\times9.8\times1\cdot\cos30°+T(2)\sin14.9°=0$$

$$T=49.53N$$



(B)

$$\sum Fx=0$$

$$H-T\sin45.1=0\therefore H=35.08N$$

$$\sum Fy=0$$

$$V+T\cos45.1-3\times9.8=0$$

$$V=-5.56N$$

2. 解：Engineering Mechanics (Dynamics), R.C. Hibbeler .Chapter 17.

$\tau = I\alpha$

$-RT = \frac{1}{2}MR^2\alpha$

$\therefore \alpha = \frac{a}{R} \quad \therefore T = -\frac{1}{2}Ma$

T-mg=ma

$a = -g\frac{2m}{M+2m} = -9.8 \cdot \frac{2 \times 2.0}{3.0 + 2 \cdot (2.0)} = -5.6 m/s^2$，向下

$T = -\frac{1}{2}Ma = -\frac{1}{2}(3.0)(-5.6) = 8.4N$

$\alpha = \frac{a}{R} = \frac{-5.6}{0.2} = -28\ {}^{rad}/_{s^2}$ 順鐘向

3.解 Principles of Geotechnical Engineering, Braja M. Das, Chapter 9

$\sigma' = \sigma_1 - u = 200 - 100 = 100kPa$

$\sigma_3' = \sigma_3 - u = 150 - 100 = 50kPa$

$\alpha_f = 45 + \frac{\phi'}{2} = 45 + \frac{28°}{2} = 59°$

破壞面正應力、剪應力及抗剪強度

$\sigma' = \frac{1}{2}(\sigma_1' + \sigma_3') + \frac{1}{2}(\sigma_1' + \sigma_3')\cos 2\alpha$

$= \frac{1}{2}(100 + 50) + \frac{1}{2}(100 - 50)\cos(2 \times 59°)$

$= 63.3kPa$

$\tau = \frac{1}{2}(\sigma_1' - \sigma_3')\sin 2\alpha$

$= 22.1 kPa$

$\tau_f = c' + \sigma' \tan\phi' = 0 + 63.3 \times \tan 28° = 33.7kPa$

$\because \tau_f > \tau \quad \therefore$ 不會破壞

4. 解：An Introduction to Geotechnical Engineering, Robert D. Holtz, William D. Kovacs

未填土時，黏土中央有效應力

$\sigma_{v1} = 17.6 \times 2 + (17.6 - 9.81) \times 5 = 74.15$

填土後，黏土中央增加應力

$\Delta\sigma = (16.7 \times 4) = 66.8$

$S = C_c \frac{H}{1+e_0} \log \frac{\sigma_1 + \Delta\sigma}{\sigma 1}$

S=0.35x1000/(1+085)log((74.15+66.8)/74.15)=52.8cm

$t=TH^2/C_v$

$t=\frac{0.845\times(\frac{10}{2})^2}{0.12}=176$ 天