

科目：普通物理

適用：土木系二、電機系二、應光系二

考生注意：

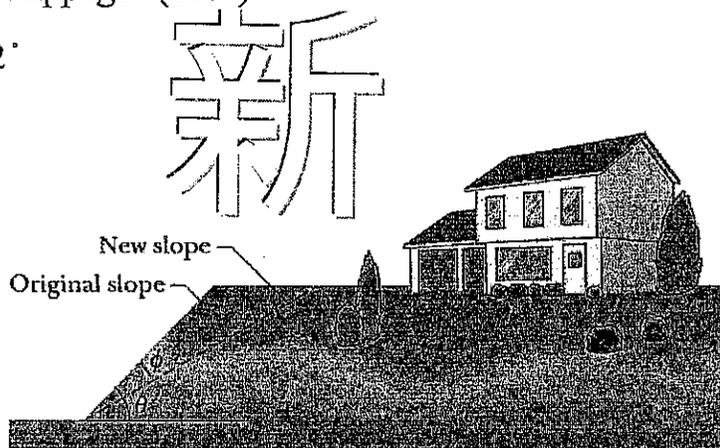
1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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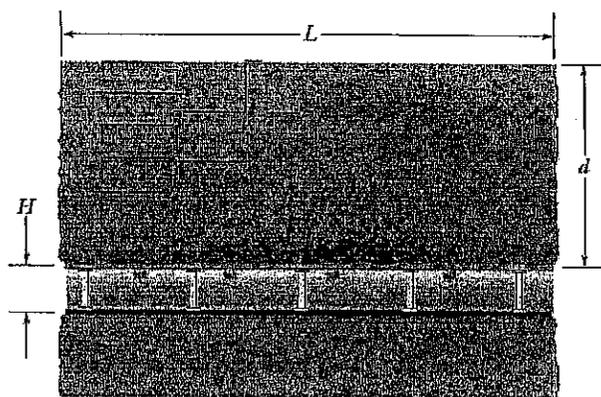
編號：312、332、352

1. A house is built on the top of a hill with a nearby slope at angle  $\theta = 45^\circ$ . An engineering study indicates that the slope angle should be reduced because the top layers of soil along the slope might slip past the lower layers. If the coefficient of static friction between two such layers is 0.4, what is the least angle  $\phi$  through which the present slope should be reduced to prevent slippage? (25%)

Hint:  $\tan^{-1} 0.4 = 22^\circ$



2. A tunnel of length  $L = 150$  m, height  $H = 7.2$  m, and width 5.8 m (with a flat roof) is to be constructed at distance  $d = 60$  m beneath the ground. The tunnel roof is to be supported entirely by square steel columns, each with a cross-sectional area of  $960$  cm<sup>2</sup>. The mass of  $1.0$  cm<sup>3</sup> of the ground material is  $2.8$  g. (a) What is the total weight of the ground material the columns must support? (15%) (b) How many columns are needed to keep the compressive stress on each column at one-half its ultimate strength? (10%)



3. A wave has a speed of  $240$  m/s and a wavelength of  $3.2$  m. What are the (a) frequency (10%) and (b) period of the wave? (15%)
4. In Figure, the ideal batteries have emfs  $\xi_1 = 10.0$  V and  $\xi_2 = 0.500\xi_1$ , and the resistances are each  $4.00 \Omega$ . What is the current in (a) resistance 2 (10%) and (b) resistance 3? (15%)