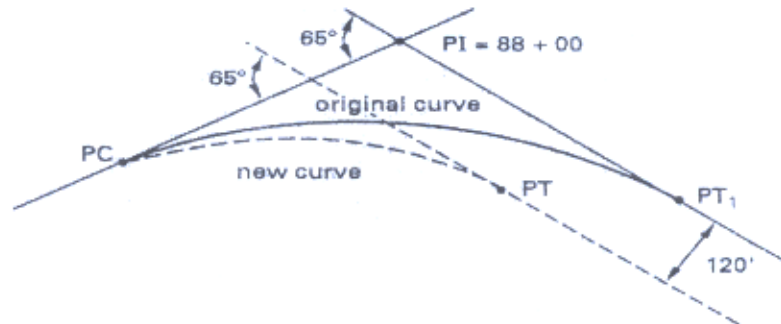1.

An existing 6° horizontal curve connects a PC and PT_1 as shown. It is desired to avoid having vehicles pass close to a historical monument, so a proposal has been made to relocate the curve 120 feet forward. The PC will remain the same. (24 分)

(1)   Find the PC station

(2)   Find the radius of curvature for the new curve

(3)   Find the PT station of the new curve.

Hint: $D = \dfrac{18,000}{\pi \cdot R} = \dfrac{5729.58}{R}$ $T = R \cdot \tan\dfrac{\Delta}{2}$ $L = \dfrac{100 \cdot \Delta}{D} = \dfrac{\Delta \cdot R}{57.2958}$

2.

(1) 我們在做粗細粒料經篩分析實驗時，殘留於各標準篩的殘留量如下表，(a)試計算其粗粒料細度模數。(b)細粒料細度模數。(c)試問細度模數最大多少，最小多少？各代表何意義？(8 分)

粗粒料	3/2"	1"	3/4"	1/2"	3/8"	#4"	底盤		
殘留重 (kg)	0	1.2	9.3	6.8	4.3	8.4	0.9	Σ = 30.9	

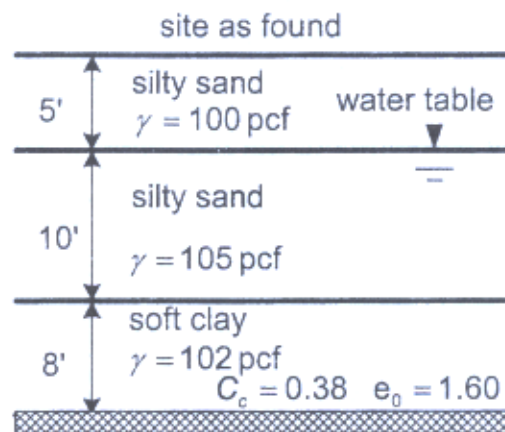| 細粒料	3/8"	#4	#8	#16	#30	#50	#100	底盤	
殘留重 (kg)	0	11.6	61.8	64.3	128.6	133.2	85.4	17.6	Σ = 502.5

(2) 有關粒料之吸水率觀念，圖示並簡述粒料四態，並於圖上標示以下名詞：有效吸水率、吸水率、表面水率、含水量。Hint: 使用下列名詞─乾燥 (oven dry , OD)，氣乾(air dry , AD)，面乾內飽和(saturated surface dry, SSD)，潮濕(wet). (8 分)

(3) 目前國內砂石資源短缺，相關單位建議「由混凝土結構物拆除之廢棄水泥混凝土與陶瓷類材料，得作為水泥混凝土和瀝青混凝土之再生粒料」，研究資料顯示此類再生料之吸水率介於 7 至 10% 之間，高於新鮮料之 1 至 4%；洛杉磯磨耗值 37.5%，接近 40%，新鮮粒料要求標準則低於 40%。(a) 請簡要論述「廢棄水泥混凝土與陶瓷類材料」添加於水泥混凝土之優缺點，(b) 請簡要論述「廢棄水泥混凝土與陶瓷類材料」添加於瀝青混凝土之優缺點，(c) 「廢棄水泥混凝土與陶瓷類材料」的規範應包含哪些項目以避免工程品質降低？ (15 分)

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3.

A construction firm wants to consolidate a clay layer at a building site as shown below.
The soil consists of 8 feet of soft clay on top of a rock layer.   The clay is covered with
15 feet of silty sand.   The water table is 18 feet above the rock later.   It is proposed
to consolidate the clay layer by surcharging the site with 10 more feet of sandy fill
(density = 110 pcf) and by dewater the sad 5 feet (i.e., lowering the water table 5 feet).
What is the settlement caused by the surcharging and dewaterting? (20 分)

Hint: $S = \left(\dfrac{C_c}{1+e_0}\right) \cdot H \cdot \log_{10}\left(\dfrac{p_0 + p_v}{p_0}\right)$

site as found

| | silty sand | water table |
5' | $\gamma = 100$ pcf | |

silty sand

10' | $\gamma = 105$ pcf

soft clay

8' | $\gamma = 102$ pcf
$C_c = 0.38$ $e_0 = 1.60$

4.

工程幾乎都會有變更設計，請從各種角度提出並說明改善的方法。例如，設計是否一定要
完成才發包施工，工程如何切割成適當的大小等。(25 分)