

QUESTION 1

The moist unit weight of a soil is 18.75 kN/m^3 . Given $w = 12\%$ and $G_s = 2.65$.

(a) Determine:

- (i) void ratio, (ii) porosity, (iii) degree of saturation, and (iv) dry unit weight.
- (b) What would be the saturated unit weight in kN/m^3 ?
- (c) How much water, in kN/m^3 , needs to be added to the soil for complete saturation?
- (d) What would be the moist unit weight in kN/m^3 when the degree of saturation is 80%?

QUESTION 2

The laboratory test results of six soils are given below.

- (a) Classify soils A, C, and E by the AASHTO Soil Classification System, and give the group indices.
- (b) Classify soils B, D, and F by the Unified Soil Classification System.

Sieve No.	Sieve analysis—percent passing					
	Soil					
	A	B	C	D	E	F
4	92	100	100	95	100	100
10	48	60	98	90	91	82
40	28	41	82	79	80	74
200	13	33	72	64	30	55
Liquid limit	31	38	56	35	43	35
Plastic limit	26	25	31	26	29	21

QUESTION 3

The results of two consolidated-drained triaxial tests on a clay are as follows:

Test I: $\sigma_3 = 83 \text{ kN/m}^2$, $\Delta\sigma = 246 \text{ kN/m}^2$.

Test II: $\sigma_3 = 165 \text{ kN/m}^2$, $\Delta\sigma = 393 \text{ kN/m}^2$.

Determine the shear strength parameters (c and ϕ).

QUESTION 4

A consolidated-undrained triaxial test was conducted on a saturated normally consolidated clay with the following results:

$\sigma_3 = 95 \text{ kN/m}^2$, $\sigma_{1(\text{failure})} = 230 \text{ kN/m}^2$, and $u_f = 40 \text{ kN/m}^2$.

Determine the shear strength parameters in terms of both total and effective stresses.