



Marks

Question (1):

- a) What are the main assumptions used in the theory of consolidation?, Also what is the difference between compressibility, consolidation and compaction? [4] [18]
- b) Explain the following : [6]
- Normally and over-consolidated clay
 - Coefficient of consolidation and preconsolidation pressure.
 - Rate of consolidation and time factor.
- c) A consolidation test was carried out on a soil specimen 19 mm height. The field bulk density and water content are 1.83 t/m^3 and 33.91%, respectively. The results of the test are as following: [8]

Pressure (kg/cm^2)	0	0.1	0.25	0.5	1	2	4	8	0
Dial reading x 0.002 (mm)	0	22	70	178	342	496	648	769	625

The final water content was 32%. Draw the e-log p curve. Determine C_c and m_v for stress range (0.5-1.0) kg/cm^2 . ($G_s = 2.70$)

Question (2):

- a) Differentiate between immediate, consolidation and creep settlement. [4] [18]
- b) For the building shown in Fig (1), determine the final settlement. If measurements indicated that it settled 3.0 cm in the first month. How long would it take to reach 50% settlement. What will be the settlement after one year? [7]
- c) The stratification at a site contains two clay layers, as shown in Fig (2). It is required to construct an embankment of large width. For the given data, calculate the settlement of the embankment. [7]

Question (3):

- a) Describe the direct shear test. What are the advantages and disadvantages of this test? [7] [18]
- b) A direct shear test was carried out on a sample of dry coarse sand. The box is 6x6 cm. When a normal load of 28.8 kg was applied, the shear load at failure was 17.3 kg. Find the angle of internal friction of the sand. [4]
- c) Triaxial tests were carried out on two specimens of soil. The results were as follows at failure: [7]

Cell pressure (kg/cm^2)	1.0	2.0
Deviator stress (kg/cm^2)	3.0	6.0

Determine the shear strength parameters of this soil. If a third identical specimen was tested under a cell pressure of 3.0 kg/cm^2 . Find the values of major and minor principal stresses.

Question (4):

- a) Write a short note about the following: [6] [18]
- The critical circle and the critical depth of slope failure.
 - The depth factor and the stability number.
 - The factors lead to slope failure.

- b) A cutting is made in a granular soil whose angle of friction is 35° . Find the safe slope angle for a factor of safety of 1.50. [6]
- c) For the cutting and soil formation shown in Fig (3), find the factor of safety against slip failure along the given trial slip circle. Take into consideration the effect of tension crack. [6]

Question (5):

- a) Discuss using neat sketches the difference between active and passive lateral earth pressure. [6]
- b) State whether the following statements are true or false and correct the false statements: [4]
- 1) The failure wedge in active lateral earth pressure is greater than that for passive case.
 - 2) The failure wedge does not happen when a retaining wall moves towards the backfill.
 - 3) The active lateral earth pressure increases if ϕ increases.
- c) For the wall shown in Fig (4), draw the distribution of active and passive lateral pressure per meter length of the wall using Rankine theory. [8]

