

**N.B.:**

- 1) Q. No. 1 and Q. No. 5 are **COMPULSORY**. Out of the remaining questions attempt any **TWO** questions from each section.
- 2) Both the sections should be written in **SEPARATE** answer books.
- 3) Figures to the **RIGHT** indicate full marks.
- 4) Draw neat labeled diagrams **WHEREVER** necessary.
- 5) Assume suitable data, if necessary.
- 6) Use of non-programmable pocket calculator is **ALLOWED**.

**SECTION –I**

- Q.1** a) Derive the expression **(05)**  
$$\gamma_d = \frac{G\gamma_w}{1+e}$$

where  $\gamma_d =$  Dry unit weight  
 $\gamma_w =$  Bulk unit weight of water  
 $e =$  Void ratio

b) Define Atterberg's limit with their application. **(05)**  
c) Describe geostatic stresses at a point with neat sketch **(04)**

**Q.2** a) A natural deposit has a bulk unit weight of  $17.64\text{kN/m}^3$  and water content of 5%. Calculate the void ratio and degree of saturation when  $G = 2.67$ . **(07)**  
b) Derive the relation between  $\gamma_{\text{sat}}$ ,  $G$  and  $e$  by using three phase diagram **(06)**

**Q.3** a) In a soil sample liquid limit = 48.5% and plastic limit is 27.2%. Natural water content is 32.8%. Calculate plasticity Index, liquidity index, consistency index. **(07)**  
b) What are the different methods to determine water content? Explain any one. **(06)**

**Q.4** a) Find the intensity of vertical pressure at a point 5m directly below a 30kN point load acting at a horizontal ground surface. What will be vertical pressure at a point 2m horizontally away from axis of loading but at the depth of 6 m. **(07)**  
b) Draw a plasticity chart with labels and write its application. **(06)**

**SECTION –II**

- Q.5** a) In falling head permeability test initial head is 1.80m and final head is 1.25 m in 30 min. The diameter of sample is 100mm and length is 125 mm. Diameter of stand pipe is 10mm. Calculate coefficient and permeability. **(05)**  
b) Discuss placement water content. **(05)**  
c) Draw a typical Mohr's circle for  $c - \phi$  soil, purely  $c$  soil and purely  $\phi$  soil. **(04)**
- Q.6** a) Derive the expression to calculate the coefficient of permeability in a stratified soil deposit in both directions with neat sketch. **(07)**  
b) What is a flow net? What are the applications of flow net? **(06)**
- Q.7** a) Determine the active and passive earth pressure on a retaining wall of height 6m, and having a backfill inclined at  $10^\circ$  with horizontal.  $\gamma = 19.6\text{kN/m}^3$   
 $\phi = 30^\circ$  **(07)**  
b) Describe Rehmann's Graphical method with neat sketch. **(06)**
- Q.8** a) Explain Unconfined compression test with neat diagram. **(07)**  
b) A soil sample having  $c = 80\text{kN/m}^2$  and  $\phi = 30^\circ$  is tested in Triaxial apparatus. **(06)**  
Determine  
i) Deviator stress at which the sample will fail when cell pressure is  $60\text{kN/m}^2$   
ii) The cell pressure if soil sample fails at a major principal stress of  $800\text{kN/m}^2$ .