

III B. TECH I SEMESTER REGULAR EXAMINATIONS, FEB - 2022
SOIL MECHANICS
(Civil Engineering)

Time: 3 Hours

Max. Marks: 60

Note: Answer **ONE** question from each unit ($5 \times 12 = 60$ Marks)

~~~~~  
UNIT-I

1. a) Define water content of soil? How will you determine this in the given soil sample with the help of pycnometer? [6M]
- b) A sample of saturated soil had a volume  $100\text{cm}^3$  and mass of  $210\text{gm}$ . When the soil was completely dried out, the volume of the sample was  $90\text{cm}^3$  and its mass was  $174\text{gm}$ . Compute
  - i) the initial moisture contents
  - ii) shrinkage limit
  - iii) specific gravity of soil

(OR)

2. a) Define and explain Atterberg's Limits? Discuss in detail as to how you will determine the shrinkage limit of a soil? [6M]
- b) The mass of moist sample of soil is  $35\text{gm}$  when measured on a tin lid of mass  $16\text{gm}$ . After drying in an oven for  $24\text{hr}$  at  $105^\circ\text{C}$ , the mass of the tin and sample is  $23\text{gm}$ . Determine the moisture content of the soil? [6M]

UNIT-II

3. a) Explain with a neat diagram of a constant head method for determining coefficient of permeability of medium sand in laboratory? [6M]
- b) The specific gravity of the particles of a sand is  $2.65$ . The porosity of the sand in a loose state is  $0.52$  and in a dense state is  $0.37$ . Find out the values of critical hydraulic gradient in these two states? [6M]

(OR)

4. a) Explain with a neat sketch a method for determining  $K$  for clayey soils in laboratory? [6M]
- b) A block of soil is  $12\text{cm}$  long and  $6\text{cm}^2$  in cross section. The water at one end of the block is  $20\text{cm}$  above a fixed plane and at the other end it is  $3\text{cm}$  above the same plane. The flow rate is  $2\text{cc}$  per  $1.5\text{min}$ . Compute the soil permeability. [6M]

UNIT-III

5. a) Explain the difference between Boussinesq's and Westergaard's methods of calculating stresses in a soil mass due to an external loading. Discuss which method you would prefer and why? [6M]

- b) A concentrated load of 30kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 8m and
- i) directly under the load
  - ii) at a horizontal distance of 6m

(OR)

6. a) Write short note on Boussinesq's 2 : 1 stress distribution method of calculating vertical normal stress in soils for rectangular areas? [6M]
- b) Determine the stress intensity 3m below a point 0.5m inside each of two adjacent sides of a 1.8 x 1.8m footing transmitting 100kN/m<sup>2</sup> at the surface. Use Boussinesq's point load formula [6M]

UNIT-IV

7. a) Explain and differentiate between compaction and consolidation in reference to soil strata? [6M]
- b) An earth embankment is compacted at water content of 17% to a bulk density of 1.90g/cc if the specific gravity of soil grains is 2.65. Calculate the void ratio and degree of saturation of the compacted embankment? [6M]

(OR)

8. a) List the assumptions made in deriving Terzaghi's one dimensional consolidation theory. [6M]
- b) A 1cm thick laboratory soil sample reaches 60% consolidation in 32.5 seconds under double drainage condition. Find how much time will be required for a 10 meters thick layer in the field to reach same degree of consolidation if it has the drainage face on one side only. [6M]

UNIT-V

9. a) Define critical void ratio for sand and explain its significance? How would you determine with a direct shear machine? [6M]
- b) In an Unconfined compression apparatus, a cylindrical sample of sandy clay, 8cm long and 4cm in diameter, fails under a load of 80N. Evaluate the shearing resistance of the soil? [6M]

(OR)

10. a) What is meant by direct shear test, triaxial test and unconfined compression test? What are the special features and uses of each? [6M]
- b) An unconfined compression test was done on a saturated clay specimen 4cm in diameter and 8cm in height. The specimen failed under an axial load of 400N, when axial deformation was 7mm. Find the unconfined compressive strength of the soil? [6M]

\*\*\*\*\*