

PMM/KS/15/6982

B.E. (Civil Engineering) C.B.S
IV Semester Examination

Paper - II

GEOTECHNICAL ENGINEERING - I

Time : Three Hours]

[Maximum Marks : 80

- Note :*
1. All questions carry marks as indicated.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.
 5. Use of non programmable calculator is permitted.

1. a) Write short note on formation of soil. 6
- b) A core cutter 12.6 cm in height and 10.2 cm in diameter weighs 1071 gm when empty. It is used to determine the in situ unit weight of an embankment. The weight of core cutter full of soil is 2970 gm. If the water content is 6%, What are the in situ dry weight and porosity. 7

OR

2. a) Derive the relationship. 7

$$\gamma = \frac{(G + eSr)\gamma_w}{1 + e}$$

b) A sample of sand above water table was found to have a natural moisture content of 15% and a unit weight of 18.84 kN/m³. Laboratory test on a dried sample indicated values of 0.5 and 0.85 for minimum and maximum void ratios, respectively for densest and loosest states. Calculate the degree of saturation and relative density. Assume G = 2.65. 6

3. a) Explain Indian standard classification of soil. 7

b) The liquid limit and plastic limit of a soil are 50% and 25% respectively. When the soil was dried from its state at liquid limit, the decrease in volume was 40% of the volume at liquid limit. When it was dried from its state at plastic limit, the volume decrease was 20% of the volume at plastic limit. Determine the shrinkage limit and shrinkage ratio. 7

OR

4. a) Explain grain size analysis and its significance. 8

b) The natural moisture content of an excavated soil is 32% its liquid limit is 60% and plastic limit is 27%. Determine the plasticity index of the soil and comment about the nature of the soil. 6

5. a) Discuss various factors affecting permeability of soil. 7

b) What will be the ratio of average permeability in horizontal direction to that in the vertical direction for a soil deposit consisting of three horizontal layers, if the thickness and permeability of the second layer are twice of those of the first and those of third layer twice those of second. 6

OR

6. a) Explain 'Quick sand condition'? Derive the equation for critical hydraulic gradient. 7

b) Explain applications of flownet. 6

7. a) Write a short note on: 6

i) Stress isobar

ii) Vertical pressure distribution on horizontal plane.

b) A concentrated load of 1000 kN is applied at the ground surface. Compute the vertical pressure.

7

- i) At a depth of 4 m below the load,
- ii) At a distance of 3 m at the same depth.

OR

8. a) A Footing of size 4m×4m carries a uniformly distributed load of 150 kN/m². Compute vertical pressure at a depth of 6m below the centre and corner of the loaded area by equivalent load method.

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b) Write a short note on New Mark's chart. 6

9. a) Explain different factors affecting compaction of soil. 6

b) The following results were obtained from standard compaction test on sample of soil.

Water Content (%)	0.12	0.14	0.16	0.18	0.20	0.22
Weight of soil (kg)	1.68	1.85	1.91	1.87	1.87	1.85

The volume of mould used was 950 ml. Obtain maximum dry density and optimum moisture content. Assume $G = 2.70$.

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OR

10. a) Explain: 6

- i) Coefficient of compressibility.
- ii) Coefficient volume change.
- iii) Compression index.

b) In the laboratory test on a clay sample of thickness 25mm drained at top only, 50% consolidation occurred in 11 Minutes. Find the time required for the corresponding clay layer in the field, 2m thick and drained at top and bottom to under go 70% consolidation. Assume $T_{50} = 0.197$ and $T_{70} = 0.405$. 7

11. a) Explain Mohr - Coulomb theory for shear strength of soil. 7

b) In an in situ vane shear test on a saturated clay, a torque of 35 Nm was required to shear the soil. The diameter of the vane was 50 mm and length 100 mm. Calculate the undrained shear strength of clay. The vane was rotated rapidly to cause remoulding of soil. The torque required to shear the soil in the remoulded state was 5 Nm. Determine the sensitivity of the clay. 7

OR

12. a) Explain unconfined compressive strength test.

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b) The stresses on a failure plane in a drained test on a cohesionless soil are as under.

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Normal stress (σ) = 100 kN/m²

Shear stress (τ) = 40 kN/m²

i) Determine the angle of shearing resistance and angle which the failure plane make with the major principal plane.

ii) Find the major and minor principal stress.

