SAMPLE PAPERS

DIPLOMA FIFTH SEMESTER EXAMINATION 2025 (JUT)

GEO TECHNICAL ENGINEERING

DIPLOMA WALLAH

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Full Marks: 70 marks | Time: 3 Hours

Instructions:

- Question No. 1 is compulsory.
- Answer any **FOUR** questions from the remaining (Q.2 to Q. 7 marks).

Q.1 Multiple Choice Questions (Compulsory)

(i) Which type of soil is transported by wind?

(a) Alluvial soil

(b) Aeolian soil

(c) Marine soil

(d) Lacustrine soil

(ii) If the void ratio (e) is 1.0, the porosity (n) is:

(a) 0.5

(b) 1.0

(c) 0.25

(d) 0.75

(iii) The water content at which soil changes from plastic state to semi-solid state is called:

(a) Liquid Limit

(b) Plastic Limit

(c) Shrinkage Limit

(d) Consistency Limit

(iv) The hydraulic gradient (i) is defined as the ratio of:

(a) Head loss to length of flow

(b) Length of flow to head loss

(c) Velocity to permeability

(d) Head loss to area

(v) Which roller is best for non-cohesive soils (Sand/Gravel)?

(a) Sheepsfoot roller

(b) Vibratory roller

(c) Pneumatic tyred roller

(d) Smooth wheel roller

(vi) A purely cohesive soil has an angle of internal friction (φ) equal to:

(a) 90 degrees

(b) 45 degrees

(c) 30 degrees

(d) 0 degrees

(vii) The standard size of the square bearing plate used in the Plate Load Test is usually:

(a) 30 cm × 30 cm

(b) 10 cm × 10 cm

(c) 100 cm × 100 cm

(d) 50 mm × 50 mm

SECTION B (Theory)

Q.2

(A) Derive the relationship between Bulk Unit Weight (y), Specific Gravity (G), Water Content (w), and Void Ratio (e). (7 Marks)

(B) Explain the determination of Specific Gravity of soil by the Pycnometer method. (7 Marks)

Q.3

(A) Explain the Standard Proctor Test. Differentiate between Standard Proctor Test and Modified Proctor Test. (7 Marks)

(B) What is Soil Stabilization? Why is it necessary in road construction? (7 Marks)

Q.4

(A) State the assumptions of Rankine's Theory of earth pressure. (7 Marks)

(B) Explain Mohr-Coulomb's failure theory. What are the components of shearing resistance of soil (Cohesion and Internal Friction)? (7 Marks)

Q.5

(A) Define Permeability. Discuss the Factors affecting Permeability of soil. (7 Marks)

(B) Explain the Core Cutter Method for finding field density. What are the limitations of this method? (7 Marks)

Q.6

(A) What is a Flow Net? State the uses/applications of a flow net (Seepage pressure, Phreatic line). (7 Marks)

(B) Briefly explain the Vane Shear Test. For which type of soil is this test most suitable? (7 Marks)

Q.7 Write Short Notes on (Any FOUR): (4 × 3.5 = 14 Marks)

(A) Atterberg's Limits

(B) Terzaghi's Bearing Capacity Assumptions

(C) Mechanical Sieve Analysis

(D) Types of Rock Formation

(E) Density Index

SOLUTIONS & KEY (PAPER 3)

MCQ Answer Key:

(i) b (Aeolian soil)

(ii) a (0.5) [Hint: n = e/(1+e) = 1/2]

(iii) b (Plastic Limit)

(iv) a (Head loss to length of flow)

(v) b (Vibratory roller)

(vi) d (0 degrees)

(vii) a (30 cm × 30 cm)