TED (21) -4011
(Revision- 2021)

A23-2103230188A

Reg.No……………….............
Signature. ....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE – APRIL - 2023

GEOTECHNICAL ENGINEERING

(Maximum Marks : 75) [Time : 3 hours]

PART–A

I. Answer **all** the following questions in one word or sentence. Each question carries 1 mark.

(9x1=9 marks)

		Module Outcome	Cognitive level
1	Soil transported by gravitational forces are termed as………..	M1.01	R
2	Identify the term 'liquidity index' of soil.	M1.04	U
3	Report any two factors affecting permeability of soil.	M2.01	U
4	Differentiate between cohesive soil and cohesionless soil.	M2.03	U
5	Summarize the meaning of the term 'zero air voids line' relating to compaction of soil.	M3.01	U
6	Differentiate between ultimate bearing capacity and safe bearing capacity.	M4.04	U
7	Identify any two open excavation methods of soil exploration.	M4.03	U
8	Enumerate any two objectives of site investigation.	M4.01	R
9	A footing that covers the entire area under beneath a structure and supports all walls and columns is known as ……………	M4.08	R

PART B

II. Answer **any Eight** questions from the following. Each question carries 3 marks.

(8x3=24)

		Module Outcome	Cognitive level
1	Define the following terms. (a)Density Index (b)Degree of saturation (c)Water content	M1.01	R
2	Sketch a typical particle size distribution curve for a well graded soil (coarse grained) sample and how is this curve used to determine the uniformity coefficient and coefficient of curvature.	M1.05	A
3	Identify the meaning of the following terms. (a) Internal friction (b) Shear strength of soil.	M2.03	U
4	Explain Darcy's law of permeability with the help of a neat sketch.	M2.01	U
5	Discuss the concept of 'strength envelope' with regard to the shear strength of soil and give the shear strength equation for purely cohesive and cohesion less soil.	M2.04	U
6	List the factors affecting compaction.	M3.02	R
7	Identify the different field methods of compaction.	M3.03	U
8	Compare primary consolidation and secondary consolidation.	M3.04	U
9	Explain wash boring method of soil exploration.	M4.03	U
10	Classify the types of piles based on the (a) Function (b) Material and Composition.	M4.08	U

PART C

Answer **all** questions from the following. Each question carries 7 marks.

(6x7=42marks)

<table>
<tr><th></th><th></th><th>Module Outcome</th><th>Cognitive level</th></tr>
<tr><td>III</td><td>Solve for the functional relationship between the following
(a) void ratio and porosity.
(b) void ratio, degree of saturation, water content & specific gravity.</td><td>M 1.02</td><td>U</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>IV</td><td>Discuss the procedure for determination of field density of soil by sand replacement method.</td><td>M1.03</td><td>U</td></tr>
<tr><td>V</td><td>Discuss the consistency limits of soil and procedure for determination of liquid limit of a given soil sample.</td><td>M1.04</td><td>U</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>VI</td><td>The in-situ density of an embankment, compacted to water content of 12% was determined with the help of a core cutter. The empty mass of the cutter was 1286 g and the cutter full of soil had a mass of 3195 g, the volume of the cutter being $1000 cm^3$. Calculate the bulk unit weight, dry unit weight and the degree of saturation of the embankment. Take the specific gravity of the soil as 2.70</td><td>M1.02</td><td>A</td></tr>
<tr><td>VII</td><td>Apply Darcy's law to determine the coefficient of permeability using variable head test with the help of a neat sketch.</td><td>M2.02</td><td>A</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>VIII</td><td>Describe the procedure for determination of shear strength by direct shear test with the help of a neat sketch.</td><td>M2.04</td><td>U</td></tr>
<tr><td>IX</td><td>Explain the procedure for determination of compaction characteristics of soil using standard proctor test.</td><td>M3.01</td><td>U</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>X</td><td>Describe Terzhagi's soil-spring analogy model to explain the process of consolidation.</td><td>M3.04</td><td>U</td></tr>
<tr><td>XI</td><td>Discuss any one geophysical methods of soil exploration.</td><td>M4.03</td><td>U</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>XII</td><td>Discuss the criteria for deciding depth of exploration.</td><td>M4.02</td><td>U</td></tr>
<tr><td>XIII</td><td>A strip footing is to carry a load of 750 kN/m at a depth of 1.6m in a c-ϕ soil having a unit weight of 18 kN/m^3 and shear strength parameters as c=20 kN/m^2 and ϕ=25°. Calculate the width of the footing, using a factor of safety of 3 against shear failure. Use Terzaghi's analysis. Assume general shear failure. Use the following data.
<table>
<tr><td>ϕ</td><td colspan="3">General shear Failure</td></tr>
<tr><td></td><td>N_c</td><td>N_q</td><td>N_γ</td></tr>
<tr><td>25</td><td>25.1</td><td>12.7</td><td>9.7</td></tr>
</table></td><td>M4.05</td><td>A</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>XIV</td><td>Illustrate and describe the plate load test used for determining the bearing capacity of soil (as per IS:1888)</td><td>M4.06</td><td>A</td></tr>
</table>

****