

MASTER OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2017
(1ST YEAR 2ND SEMESTER)
(4th / 2nd Semester/Repeat/Supplementary/Spl. Supplementary/Old/Annual/Biannual)
SUBJECT: Ground Improvement Techniques
(Name in full)

Full Marks 30/100

Time: ~~Two hours/Three hours/Four hours/Six hours~~

No. of Questions	PART I (MARKS 60)	Marks
	<u>Answer all questions</u>	
Q1	<p>A 70 m diameter and 14 m high petroleum storage tank is to be constructed at a site at Haldia with subsoil data given below :</p> <p>Depth 0 – 3.0m : Brownish grey silty clay / clayey silt $\gamma = 18.6 \text{ kN/m}^3$, $C_u = 35 \text{ kN/m}^2$, $m_v = 0.0004 \text{ m}^2/\text{kN}$</p> <p>Depth 3.0 - 15.0m : Dark grey silty clay / clayey silt with decomposed wood $\gamma = 17.5 \text{ kN/m}^3$, $C_u = 25 \text{ kN/m}^2$, $m_v = 0.0006 \text{ m}^2/\text{kN}$</p> <p>Depth 15.0 - 18.0m : Stiff / very stiff bluish / mottled brown silty clay / clayey silt with rusty spots $\gamma = 19.5 \text{ kN/m}^3$, $C_u = 75 \text{ kN/m}^2$, $m_v = 0.0003 \text{ m}^2/\text{kN}$</p> <p>Depth > 18.0m till 35.0m : Dense / very dense sand $\gamma = 20 \text{ kN/m}^3$, $\phi = 36^\circ$</p> <p>It is proposed to do the construction after installing stone column of diameter 850mm at the site.</p> <p>(a) What will be the required spacing and length of stone columns for the proposed construction?</p> <p>(b) Calculate the bearing capacity and maximum settlement under superimposed load.</p> <p>(c) What will be the time required to reach 95% consolidation for the ground considering sand drain action of the stone column reinforced subsoil?</p>	7+8+5 = 20
Q2	<p>A 10m high reinforced earth wall with galvanized steel-strip reinforcement in granular backfill has to be constructed.</p> <p>Properties of granular backfill : $\phi = 36^\circ$ Bulk density = 17.5 kN/m^3</p> <p>Properties of foundation soil : $\phi = 34^\circ$ Cohesion = 0.0 Bulk density = 19.5</p> <p>Galvanized steel reinforcement : Width of strip = 75 mm Vertical spacing of strip = 600 mm Horizontal spacing of strip = 1000 mm yield strength of reinforcement = 2700 kg/cm^2 $\Phi_u = 22^\circ$</p> <p>Check the external as well as internal stability of the wall.</p>	10+10 = 20
Q3	<p>(a) Discuss the functions and various applications of geosynthetics in civil engineering construction.</p> <p>(b) Discuss how use of a layer of geotextile reduces the thickness of granular subbase / base / fill in an unpaved road and also improves its performance.</p>	10+10 = 20

M.E. CIVIL ENGINEERING FIRST YEAR SECOND SEMESTER EXAM 2017
 (1st/2nd Semester/Repeat/Supplementary/Spl. Supplementary/Old/Annual/Bi-Annual)

SUBJECT: GROUND IMPROVEMENT TECHNIQUES (SMFE)

(Name in full)

PAPER ××××

Time: ~~Two hours~~/ Three hours/~~Four hours~~/~~Six hours~~

Full Marks 40 (for Part-II)

(15/50 marks for each part)

Use a separate Answer-Script for each part

No. of
Question

PAGE: 1 OF 1

Marks

Part -II

- *Maintain neatness.*
- *Mobile phone is not allowed with the candidate in any mode during examination*
- *Assume reasonable data if it is not supplied.*
- *Answer any two questions, All drawings-must be drawn by pencil*
- *No code etc. will be needed to answer the questions of this part*

- (1)(A) Explain how ground treatment can be implemented or executed in following stepwise phases: 4 × 3 =12
- i. Defining the required soil behavior,
 - ii. Deficiencies in the soil behavior of the site,
 - iii. Risk mitigation,
 - iv. Application of appropriate treatment process/es.
- (B) What the alternatives are for ensuring the safety when construction is to take place on ground with inadequate load carrying properties? Among the alternatives which one is more acceptable in modern days and why? 4+4 =8
- (2)(A) What is meant by grouting? How the condition of a ground (with less bearing capacity) can be improved using grouting techniques? 2+4=6
- (B) What is meant by groutability ratio? 2
- (C) State the procedure and the applicability of: 6+6=12
- A) Sand-cement grouting,
 - B) Cement Bentonite grouting.
- (3)(A) What are the principle forms of densification? What are the similarities among them? What are the differences among them? 2+3+3=8
- (B) How the ground can be improved using drop hammer? 6
- (C) State how compaction piles may improve the condition of a ground (with less bearing capacity). 6

End of the Questions