MASTER OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2018
(1ST YEAR 2ND SEMESTER)
(1st / 2nd Semester/ Repeat/ Supplementary/Spl. Supplementary/Old/ Annual/ Biannual)
SUBJECT: Ground Improvement Techniques(SMFE)
(Name in full)

Time: ~~Two hours~~/Three hours/~~Four hours/ Six hours~~   Full Marks ~~30~~/100

No. of Questions	PART I (MARKS 60)	Marks
	Answer all questions	
Q1	A 50 m diameter and 11 m high petroleum storage tank is to be constructed at a site at Budgebudge with subsoil data given below : Depth 0 – 3.0m : Brownish grey silty clay / clayey silt $\gamma = 18.0$ kN/m^3 , $C_u = 34$ kN/m^2, $m_v = 0.0004$ m^2/kN Depth 3.0 – 16.0m : Dark grey silty clay / clayey silt with decomposed wood $\gamma = 17.0$ kN/m^3 , $C_u = 20$ kN/m^2, $m_v = 0.00065$ m^2/kN Depth 16.0 – 20.0m : Stiff / very stiff bluish / mottled brown silty clay / clayey silt with rusty spots $\gamma = 19.0$ kN/m^3 , $C_u = 70$ kN/m^2, $m_v = 0.0003$ m^2/kN Depth > 20.0m till 35.0m : Dense / very dense sand $\gamma = 20$ kN/m^3, $\varphi = 36^0$ It is proposed to do the construction after installing stone column of diameter 850mm at the site. (a) What will be the required spacing and length of stone columns for the proposed construction? (b) Calculate the bearing capacity and maximum settlement under superimposed load. (c) What will be the time required to reach 95% consolidation for the ground considering sand drain action of the stone column reinforced subsoil?	7+8+5 = 20
Q2	12m high reinforced earth wall are to be constructed along the approaches of a proposed flyover over a stretch of NH 6. It is proposed to use galvanized steel-strip reinforcement along with granular backfill. Properties of granular backfill : $\varphi = 36^0$ Bulk density = 19.5 kN/m^3 Properties of foundation soil : $\varphi = 34^0$ Cohesion = 0.0 Bulk density = 19.0 Galvanized steel reinforcement : Width of strip = 75 mm Vertical spacing of strip = 600 mm Horizontal spacing of strip = 800 mm Yield strength of reinforcement = 2700 kg/cm^2 Interface Angle between strip and backfill, $\delta = 22^0$ Check the external and internal stability of the wall.	10+10 = 20
Q3	(a) Discuss the principle of radial drainage for accelerating the consolidation of soft clay deposit under superimposed load (b) Discuss with neat sketches the design methodology of a geotextile reinforced unpaved roads	10+10 = 20

M.E. CIVIL ENGINEERING FIRST YEAR
SECOND SEMESTER EXAM 2018
(~~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

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) Discuss about factors influencing the compaction and procedures of compaction in field and laboratory. **20**

(2)(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**

(3)(A) What is the mechanism, through which grouting helps to improve the bearing capacity? **2**

(B) What is meant by Groutability ratio? **2**

(C) What are the materials, mixtures and admixtures for (any four): **4 × 4 =16**
   i. Sand- Cement grouting,
   ii. Clay- Cement grouting.
   iii. Cement – Bentonite grouting,
   iv. Portland cement grouting,
   v. Single Solution Sodium Cilicate grouting,
   vi. Accrylamide grouting.

End of the Questions