Form A: Paper-setting Blank *Ref No.* Ex/PG/CE/T/129C/2024

**M.E. CIVIL ENGINEERING FIRST YEAR**
**SECOND SEMESTER EXAM 2024**
SUBJECT: **GROUND IMPROVEMENT TECHNIQUES (SMFE)**
**(Name in full)**

**PAPER** ××××

**Time: Three hours** **Full Marks =100**
**(60 marks for this part i.e. for part I)**

**Use a same Answer-Script for each part**

| No. of Question | ***Part –I*** | Marks |
|---|---|---|
| | *1) Answer question number 1, question number 2, question number 3 and question number 4.*<br>*2) Assume reasonable values of data if it is not supplied,*<br>*3) Answer the Part 1 and Part 2 separately.*<br>*4) There is no need of any code etc. for answering Part- II.* | |
| **1** | • **Answer any twelve MCQ from the given sixteen MCQ.**<br>• Some MCQ question may have more than one correct alternative, so examine each alternative of each MCQ before giving your choice of the concerned MCQ.<br>• Giving all alternatives of any MCQ as your choices as correct answers of the concerned MCQ, will lead to zero marks for the concerned MCQ.<br>• If anyone attempts more than 12 MCQ, then the first 12 MCQ will be evaluated and considered only and the other extra MCQ will not be evaluated and will not be considered. | [~~14~~ 12] |

✓ ***Instructions (with examples) for giving answers to MCQ in this part:***

***Suppose you have to answer following MCQ in your answer script:***

*MCQ 1) Name of the present prime minister of the India*
*a) Jawaharlal Nehru,*
*b) Narendra Modi,*
*c) Manmohan Singh,*
*d) None of the above.*

*MCQ 2) Virat Kohli is*
*a) Captain of the Indian Cricket team,*
*b) Player of Royal Challengers Bengaluru,*
*c) President of the BCCI,*
*d) All of the above.*

*MCQ 3) Within the last ten months*
*a) Iran attacked Israel,*
*b) IIC World Cup has been started,*
*c) China attacked India,*
*d) All of the above.*
.....

***Then during giving answer in your answer scripts, you have to give the answers of the above MCQ in the following style only:***

*Part –I*

*Answer to MCQ 1) : b) Narendra Modi,*

Form A: Paper-setting Blank *Ref No.* Ex/PG/CE/T/129C/2024

**M.E. CIVIL ENGINEERING FIRST YEAR**
**SECOND SEMESTER EXAM 2024**
SUBJECT: **GROUND IMPROVEMENT TECHNIQUES (SMFE)**
**(Name in full)**

**PAPER ××××**

**Time: Three hours** **Full Marks =100**
**(60 marks for this part i.e. for part I)**

**Use a same Answer-Script for each part**

*Answer to MCQ 2) : b) Player of Royal Challengers Bengaluru,*
*Answer to MCQ 3) : a) Iran attacked Israel,*
*b) IIC World Cup has been started,*

.....

*Note:*
*(A) In MCQ 2, if anyone give alternative "a)" as one of the correct alternative, he/ she is wrong as Virat Kohli was (not "is") Captain of the Indian Cricket team. So, read each word of the alternatives very carefully before giving your answer.*

*(B) In MCQ 3, if anybody either alternative "a)" or alternative "b)" as the correct alternative, he/ she will get 0.5 marks as there were two correct alternatives.*

*(C)There is no negative marking for choosing wrong alternative as your choice in any MCQ.*

**Choose the correct alternative/ alternatives for 12 MCQs from the following 16 MCQs:**

MCQ (1) The Mechanics of Ground Improvement mainly depends upon *1*
(a) Water Content
(b) Grain Size Distribution
(c) Structural arrangements of the particles
(d) All of the above

MCQ (2) Generally ground Improvement is called for a soft cohesive soil when *1*
(a) Low undrained shear strength is less than 1.5 t/m$^2$
(b) Low undrained shear strength is less than 2.5 t/m$^2$
(c) Low undrained shear strength is less than 3.5 t/m$^2$
(d) None of the above

MCQ (3) The types of vertical drain include *1*
(a) PVDs or Wick Drains
(b) Sand Drains
(c) Silt drains,
(d) None of the above

MCQ (4) The most common patterns used for installing vertical drains, are: *1*
(a) Square Pattern,
(b) Oval Pattern,
(c) Trapezoidal pattern,
(d) All of the above.

MCQ (5) Example/s of related data with pre-densification properties of soil is/ are: *1*
(a) SPT data,
(b) CPT data,
(c) Data of plate load test,

Form A: Paper-setting Blank *Ref No.* Ex/PG/CE/T/129C/2024

**M.E. CIVIL ENGINEERING FIRST YEAR**
**SECOND SEMESTER EXAM 2024**
SUBJECT: **GROUND IMPROVEMENT TECHNIQUES (SMFE)**
**(Name in full)**

**PAPER** ××××

**Time: Three hours** **Full Marks =100**
**(60 marks for this part i.e. for part I)**

**Use a same Answer-Script for each part**

(d) All of the above.

MCQ (6) Plastic core and geotextile filter are required materials for: *1*
(a) Natural fiber drains,
(b) Band drains,
(c) Steel drains,
(d) All of the above.

MCQ (7) Grouting in the soil formation is usually done for: *1*
(a) Increasing the stability against lateral movement,
(b) Reducing the permeability,
(c) Increasing the bearing capacity,
(d) All of the above.

MCQ (8) The less extensively used grout (when comparing with the other grouts) is *1*
(a) Bituminous grout,
(b) Soil grout,
(c) Cement grout,
(d) Chemical grout.

MCQ (9) For successful penetration of grout in soil formation, a minimum value of "twenty five" for the concerned "groutability ratio", was suggested by *1*
(a) Louis Menard,
(b) Tsytovich,
(c) Johnson,
(d) Skempton.

MCQ (10) For grouting in rock fissure (wider than 0.1 mm), the grout which is considered to be most effective, is *1*
(a) Bituminous grout,
(b) Soil grout,
(c) Cement grout,
(d) Chemical grout.

MCQ (11) Among chemical grouts, the most commonly used grout is the *1*
(a) Oxalate injection,
(b) Aluminate injection,
(c) Sulphate injection,
(d) Silicate injection.

MCQ (12) During Chemical grouting, some of the method/s of using chemicals is/ are *1*
(a) Joosten Method,
(b) K.L.M. Method,
(c) Keller (North America) Method,
(d) None of the above

Form A: Paper-setting Blank *Ref No.* Ex/PG/CE/T/129C/2024

**M.E. CIVIL ENGINEERING FIRST YEAR**
**SECOND SEMESTER EXAM 2024**
SUBJECT: **GROUND IMPROVEMENT TECHNIQUES (SMFE)**
**(Name in full)**

**PAPER** ××××

**Time: Three hours** **Full Marks =100**
**(60 marks for this part i.e. for part I)**

**Use a same Answer-Script for each part**

MCQ (13) Among the terms "ground treatment", "ground improvement" and "ground modification", "ground improvement" may be regarded as *1*
(a) The process,
(b) The purpose of the process,
(c) The result of the process,
(d) All of the above.

MCQ (14) Among the basic approaches required for the ground improvement, there is/ are process/es like *1*
(a) Drainage,
(b) Drying,
(c) Heating,
(d) All of the above.

MCQ (15) The materials which are generally used to construct stone column, are *1*
(a) Bentonite or Cement Slurry,
(b) Non aggregate Materials,
(c) Cement slurry,
(d) All of the above

MCQ (16) The stone columns constructed by drilling holes into the ground and filling them with compacted gravel or crushed stone, are known as: *1*
(a) Vibro replacement stone columns,
(b) Vibro compaction stone columns,
(c) Aggregate Piers,
(d) All of the above

**Answer all the following questions:**

Q (2) **Answer any two from the following (a), (b) and (c).** ***2 × 8 = 16***

(a) What is grouting and what is the purpose of grouting? Explain in details.
(b) What is meant by groutibility ratio? How is the groutibility ratio generally dependent on certain properties of the grout and the ground material?
(c) Through which mechanism the condition of a ground (with less bearing capacity) get improved through the use of grouting techniques?

Q (3) **Answer any two from the following (a), (b) and (c).** ***2 × 8 = 16***

(a) Is there any difference between vertical drain, stone column, granular pile? Explain in details
(b) What is a vertical drain and what are the purposes and applications of vertical drains?
(c) What are the ways to construct or install a vertical drain?

Form A: Paper-setting Blank *Ref No.* Ex/PG/CE/T/129C/2024

**M.E. CIVIL ENGINEERING FIRST YEAR**
**SECOND SEMESTER EXAM 2024**
SUBJECT: **GROUND IMPROVEMENT TECHNIQUES (SMFE)**
**(Name in full)**

**PAPER** ××××

**Time: Three hours** **Full Marks =100**
**(60 marks for this part i.e. for part I)**

**Use a same Answer-Script for each part**

Q (4) **Answer <u>any two</u> from the following (a), (b) and (c).** ***2 × 8 = 16***

(a) What are the factors for fixing up depth of stone columns?
(b) What materials are used to construct stone column? What steps are generally involved in the construction process of a stone column?
(c) What are the advantages of stone column?

***End of the part –I of the question.***

*Ref. No.* Ex/PG/CE/T/129C/2024

M.E. CIVIL ENGINEERING EXAMINATION 2024

[1st Year; 2nd Semester Exam 2024]

# Ground Improvement Techniques

Part II

Total Time: Three Hours

Full Marks 100
(Part I: 60 + Part II: 40)

*Use a separate Answer-Script for each part*

## Part II (40 Marks)

Answer All

| | | | |
|---|---|---|---|
| 1. | Draw a typical Proctor Compaction curve for Clay soil and explain the behavior. | (5) | CO1 |
| 2. | 'Reinforcing a soil with geosynthetics can be treated as enhancement of the Internal Stability'. Explain the statement. | (5) | CO1 |
| 3. | For a 15 m high MSE wall, the Constrained Dilatancy at the top and bottom most reinforcement is zero. Explain the mechanism. | (5) | CO1 |
| 4. | Define the method 'Pre-Loading with Vertical Drain" with schematic diagram. How is it helpful for any Civil-Construction? | (5) | CO3 |
| 5. | A geotextile-reinforced retaining wall is 16 ft. high. For the granular backfill $\varphi'_1 = 36°$ and $\gamma_1 = 110$ lb/ft$^3$ and geotextile $\sigma_G = 80$ lb/in. Design the wall determining the $S_v$, L and $l_l$. | (10) | CO5 |
| 6. | Development of Apparent cohesion and improvement in angle of internal friction angle can be possible if reinforcement (planar) is used in dry sandy soil. Estimate the amount of cohesion and improvement in internal friction angle with neat sketch. | (10) | CO5 |

~~~XXX~~~
~~~