Registration No.: | | | | | | | | | | |

Total Number of Pages: 02

Course: B.Tech
Sub_Code: CIPE3002

5th Semester Regular Examination: 2025-26
SUBJECT: Ground Improvement
BRANCH(S): C&EE, CIVIL
Time: 3 Hours
Max Marks: 100
Q.Code: U339

Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define the failure strain range for treated soil.
b) State any two characteristics of an ideal chemical grout.
c) Differentiate between permeation grouting and injection grouting.
d) Define swelling potential of expansive soils and state its relation with the plasticity index.
e) What is dynamic compaction? Mention one of its uses during seismic design.
f) Define the transmissivity of a geotextile.
g) How does a geogrid differ from a geotextile?
h) What is an earthquake drain? Sketch its basic arrangement.
i) What is soil nailing? Mention one failure mode in nailed walls.
j) What is a zero-air-void line and why is it important?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain how the load-carrying capacity of stone columns is estimated. Discuss three modes of failure.
b) Describe key soil properties modified by additives. Explain their functions with examples.
c) Outline the procedure of compacting granular soils using blasting. State important precautions.
d) Describe the formation of expansive soils. List types of structural damages and explain why lightly loaded structures suffer more.
e) Explain factors affecting soil-cement performance. Describe the construction sequence of a soil-cement subgrade.
f) Discuss the geological classification of rocks. Explain soil formation by chemical weathering.
g) Describe any three dewatering methods with neat sketches.
h) What is ground modification by admixtures? Explain one admixture-based stabilization method.

i) Explain the factors influencing strength gain in chemically treated soils.

j) Explain the roles of geosynthetics in filtration, drainage, and seepage control.

k) Write short notes on uniaxial and biaxial geogrids.

l) Write a brief technical note on the formation and application of stone columns in soft ground improvement.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Define grouting and discuss in detail the various types of grouting used in ground modification. With neat sketches, explain permeation, compaction, jet, and fracture grouting. Highlight the advantages, limitations, and selection criteria for each type. **(16)**

Q4 Provide typical engineering properties of Black Cotton Soil. Explain the mechanisms of swelling and shrinkage and describe major structural damages caused. Discuss any two laboratory methods to determine swelling characteristics and outline practical field stabilisation practices. **(16)**

Q5 Explain how sand drains and prefabricated vertical drains accelerate consolidation of soft clays. Describe installation methods, smear zone effects, drain spacing, and the concepts of equal strain and free strain conditions. Include neat sketches. **(16)**

Q6 Discuss the mechanism of load transfer between soil and reinforcement. Explain tensile rupture and pull-out failures in reinforced earth retaining walls using neat diagrams. Present the design considerations of reinforced embankments and shallow foundations on reinforced soils. **(16)**