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

Total Number of Pages : 02 **Course: B.Tech**

Sub_Code: PCI6I101

6th Semester Back Examination: 2022-23

SUBJECT: Foundation Engineering

BRANCH(S): CIVIL

Time : 3 Hour

Max Marks : 100

Q.Code : M311

Answer Question No.1 (Part-1) 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) What are the differences between earth pressure at rest, active earth pressure and passive earth pressure?

b) What are the limitations of the plate load test?

c) Define Net ultimate bearing capacity and Net safe bearing capacity.

d) Define coefficient of earth pressure.

e) Define the group efficiency of pile foundation.

f) Define negative skin friction.

g) What are the various forces acting on a well foundation?

h) Explain disturbed & un-disturbed samples.

i) What is area correction in collecting the soil samples with a sampler?

j) Define: (a) rock mass, (b) joints, (c) faults, (d) folds

Part-II

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

a) Compare Rankine's theory and Coulomb's theory for estimating earth pressure. State the conditions for their validity.

b) Explain the different modes of failure of foundation soil.

c) Discuss the effect of the water table on bearing capacity of soil.

d) State different types of pile based on their application.

e) Briefly explain the load transfer mechanism in pile foundation with a neat sketch.

f) What are the different types of mat foundation? When are they preferred? Explain.

g) What do you understand by under-reamed piles and what situations dictate their use?

h) Briefly explain static and dynamic formulae of load carrying capacity of piles.

i) Discuss the use of Culmann's graphical solutions for determining earth pressure.

j) Discuss wash boring method of soil exploration.

k) Write a note on dynamic cone penetration test.

l) Discuss various types of defects in rock.

Part-III

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

Q3 **a)** Discuss various stability conditions checked for design of retaining walls. **(8)**

b) Determine the active earth pressure on a vertical retaining wall supporting a two-layer soil with a horizontal surface. The soil properties of the two layers are as follows (water table present at a depth of 2 m from the ground level): **(8)**

Top layer: $\phi' = 35°$, $\gamma' = 17$ kN/m^3, depth = 2 m

Bottom layer: $\phi' = 38°$, $\gamma_{sat} = 18$ kN/m^3, depth = 2 m (assume $\gamma_w = 10$ kN/m^3)

Q4 **a)** Discuss the Standard penetration test and write the corrections applied to the results. **(8)**

b) A square column foundation has to be designed for a gross allowable total load of 250 kN. If the load is inclined at an angle of 15° to the vertical, determine the width of the foundation. Take a factor of safety of 3.0 and use IS Code method. $\gamma = 19$ kN/m^3, $\phi = 35°$, and $c = 5$ kN/m^2. The depth of the foundation is 1.0 m. ($N_c = 46.12$, $N_q = 33.3$ and $N_\gamma = 48.03$) **(8)**

Q5 **a)** Discuss the different components of a well foundation and their utility with a neat sketch. **(8)**

b) A group of 9 piles with three piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length of piles were 30 cm and 10 cm respectively. The unconfined compression strength of clay is 70 kN/m^2. If the piles were spaced at 90 cm centre to centre, compute the allowable load on the pile group on the basis of shear failure criteria for a factor of safety of 2.5, neglect bearing at the tip of piles, take m = 0.6 for shear mobilization around each pile. **(8)**

Q6 **a)** Enumerate the scope and objectives of methods of soil exploration. **(8)**

b) What are the various geophysical methods? Discuss any one of them. **(8)**