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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Third Semester, M.Tech. - Civil Engineering (MCAD)

Semester End Examination; Dec - 2017/Jan - 2018

Computer Aided Design of Sub-Structures

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Explain the effects of shape factors, Depth factors, Eccentric-inclined loads, and inclination factors as used in generalized bearing capacity equations. 10

b. Design an isolated footing for a column of 400 mm x 400 mm size subjected to a vertical load of 360 kN, moment of 400 kN-m and the shear load of 360 kN, the soil property is as follows: C = 6 kN/m^2, ϕ = 39^o and Bulk density = 18 kN/m^3. 10

2 a. What are the different types of settlements that occur in a foundation? How are they estimated? 10

b. A square footing 2 M wide is proposed on a 10 M thick ground, made of normally saturated clay, to carry a load of 800 kN, Estimate the total settlement, using the following details:

i) Water content = 30% ii) Liquid limit = 80%

iii) Saturated density = 18 kN/m^3 iv) Soil Modulus = 24 MPa

v) Poisson's ratio = 0.3 vi) Inclination factor = 0.87 10

vii) Coefficient of secondary compression = 0.0002.

A laboratory sample 48 mm thick with double drainage facility experienced complete solution under same pressure, in two hours, life span of structure = 150 years. Assume single drainage from top of the field. Take G = 2.7.

UNIT - II

3 a. Discuss the factors influencing the selection of depth of foundation. 10

b. Discuss the method of foundation analysis by soil line method. 10

4. Draw the bending moment diagram for the combined footing using finite difference approach

Length of combined footing = 6.12 M

Depth of combined footing = 0.85 M

Consider a column load of 700 kN acting at a distance of 1.6 M from the left edge and another column load is 270 kN acting at a distance of 0.18 M from the right edge of the footing. The value of modulus of a sub grade reaction = 5x10^4 kN/m^3 is determined from plate load test conducted on a plate of 30 cm x 30 cm size. Consider E = 0.2x10^8 kN/m^2. Width of footing = 1.2 M. 20

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UNIT - III

5 a. Explain the procedure for separating frictional component from tip resistance using cyclic pile load test. 10

b. Discuss the use of penetration tests for estimating the load carrying capacity of piles. 10

6. Design a friction pile group to carry a load of 3000 kN including the weight of pile cap at a site where the soil uniform clay to a depth 20 M, underlain by rock. Average unconfined compression strength of clay is 70 kN/m^2. The clay may be assumed to normal sensitivity and normally consolidated with liquid limit +60%. A FOS of 3 is required against shear failure. 20

UNIT - IV

7 a. Give necessary information required for design and construction of transmitting line tower foundation. 10

b. How is the safety of tower foundation checked against uplift, overturning and lateral thrust? 10

8. Design a suitable foundation for a 20º angle tower to be used in a double circuit 132 kV transmission line. The foundation is located in medium dense sand with $\phi = 30^o$, $\Upsilon = 17$ kN/m^3, Depth of the ground water table is 5.0 M below the ground level use load factors of 2 and 1.5 for normal and broken wire conditions respectively. The foundation is subjected to the following loading: 20

Name of load	Load in kN	Under condition
	N.C.	B.W.C.
Downward	400	450
Uplift	300	380
Power in transverse direction	3.3	25
Shear in longitudinal direction	---	16

UNIT - V

9 a. Discuss criteria for the design of foundation for reciprocating machine. 10

b. Explain vibration insulation. 10

10 a. Explain Barkan's method of machine foundation design. 10

b. Explain the block vibration test for vertical vibration. 10

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