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

(An Autonomous Institution affiliated to VTU, Belgaum)

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

Semester End Examination; Dec - 2016/Jan - 2017

Computer Aided Design of Substructures

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Assume missing data, if any.

UNIT - I

1 a. Distinguish between general and punching shear failures. 8

b. A square footing is proposed to carry a load of 1000 kN on a ground with unit cohesion of 15 kN/m^2, friction angle of 20^o and unit weight of 16 kN/m^3 at a depth of 1.2 m below ground level. If the safety factor is 2.5, find the size of the footing. Take, 12

$$N_q = \tan^2\left(45+\frac{\phi}{2}\right)e^{\pi\tan\phi}$$

$$N_c = \left(N_q - 1\right)\cot\phi$$

$$N_\gamma = 2\left(N_q + 1\right)\tan\phi$$

2 a. Distinguish between consolidation and secondary settlements. 6

b. A ground level water tank of radius 3 m, height 5 m and free board of 0.5 m is proposed at a site consisting of 6 m thick saturated normally consolidated clay resting on rocky stratum. The properties of clay are as follows: 14

Soil modulus = 20 MPa, Poisson's ratio = 0.4, Influence factor = 0.9, Natural water content = 30%, Liquid limit = 50%, Specific gravity of soil solids = 2.7, Angle of load dispersion = 45^o. If the degree of consolidation is 50%, estimate the total settlement.

UNIT - II

3 a. Discuss the methods of treatment for foundation of a light structure on B.C. Soil. 10

b. What is liquefaction? List the ill effects of liquefaction. Discuss any two measures to mitigate against liquefaction. 10

4 a. Discuss the steps involved in the analysis of strip footing by soil line method. 8

b. A 4 m long, 1 m wide and 0.6 m deep combined footing carries loads of 1000 kN each at 0.5 m from each end. Footing is made of M30 grade concrete and tests on ground with modulus of subgrade reaction of 50 MN/m^3. Using finite difference approach, find the displacement at the centre. 12

Contd….2

UNIT - III

5	a.	Discuss a method of analysis of piles for lateral load carrying capacity.	10
	b.	Explain the method of separating skin frictional component from end bearing component using cyclic pile load test.	10
6	a.	Explain the method of evaluating the capacity of pile group. Find the group efficiency of 9 piles arranged in a square pattern equally spaced.	8
	b.	A pile foundation system is proposed in a 12 m thick clayey soil having unconfined compressive strength of 180 kN/m^2. If adhesion factor is 0.8, design a pile group neglecting end bearing. Total load on foundation is 1000 kN.	12

UNIT - IV

7	a.	What are the main requirements in the design of foundation for transmission line tower?	10
	b.	Discuss the critical forces acting on the foundation of transmission line tower.	10
8	a.	Discuss the basic information to be collected in the design of foundation for transmission line tower.	10
	b.	Define soil-structure-interaction. What is its significance? Discuss how soil structure interaction can be considered in the design of foundations?	10

UNIT - V

9	a.	Which are the dynamic properties of soil? How are they determined?	10
	b.	Define 'Natural frequency' of a vibrating system. Explain Barkan's method of determining the natural frequency of foundation-soil system.	10
10	a.	Discuss the method of analysis and design of block foundation carrying a vibrating machine.	10
	b.	Resonance occurs at a frequency of 20 cycles/sec in a vertical vibration test on a block 1 m x 1 m x 1 m. Determine the coefficient of elastic uniform compression of soil given the weight of oscillator is 800 N and that the force produced by it at 10 cycles/sec is 10000 N. Find the amplitude in vertical direction at 10 cycles/ sec.	10

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