No. of Printed Pages : **4 + Drawing Sheet** | **BICEE-022**

B.TECH. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

December, 2013

BICEE-022 : ADVANCED DESIGN OF FOUNDATION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. All questions carry **equal** marks.*

1. (a) Illustrate with sketches the deflection diagram and contact pressure diagram of a flexible raft foundation. 5

   (b) Describe the various factors which affect the contact pressure distribution beneath a raft foundation. 5

2. (a) Derive the basic equation for the design of slabs resting on elastic foundations. 5

   (b) A trapezoidal footing is required to be designed to support two square columns of 30 cm and 50 cm sides respectively. The columns are 6.0 m apart (clear distance) and the safe bearing capacity of the soil is 400 kN/m^2. The bigger column carries load of 5000 kN and the smaller one 3000 kN. Design a suitable size of footing so that it does not extend beyond the faces of the column. 5

3. (a) Give the different classifications of sheet piles. 5

(b) Derive an expression for the design of an " Anchored Bulk head by Free Earth Support Method" driven in granular soil and also supporting the same soil on the other side. 5

4. (a) Describe the various types and uses of Cofler dams. 5

(b) An anchored bulk head 4.8m high retains sand on both sides. The anchor rods are 1.0m below the top and depth of the embedment is 1.44 m. Determine the factor of safety against failure. Angle of internal , friction of sand is 35° and the sand is submerged throughout with a unit weight of 10 kN/m^3. Comment if the depth of embedment is adequate. If not, obtain the depth of embedment which rendor the design adequate. (Consider factor of safety = 2) 5

5. (a) Define Rocking, Yawning and Pitching. 5

(b) Using Barkan's expression for natural frequency and the amplitude of vibrations, calculate the change in the percentage amplitude in terms of 'r' $\left(r = \frac{w}{w_n}\right)$, if the soil mass participating in the vibration is 23% of m (mass) . Also, calculate this change for r = 0.3 and r = 2. 5

6. (a) Describe the method of determining the shear Modulus (G) and Young's Modulus of soil (E) in the Field or Laboratory based on I.S. Code provisions. 5

(b) Give a neat sketch of a vibration block foundation used in the determination of Dynamic Soil Constants. 5

7. (a) Describe the various types of shell foundations along with its Merits and Demerits. 5

(b) Give the general principles of design of a shell foundation. How the contact pressures act on it ? 5

8. (a) Discuss the structural form and efficiency of a shell foundation Visa - Vis raft foundation. When shell foundations are preferred ? 5

(b) Describe the special features which are considered in the design of a foundation for a transmission line tower. Which is the worst situation for design: a broken overhead transmission line or un - broken overhead transmission line. 5

9. (a) What type of forces should be taken into account while designing foundation for a Chimney ? 5

(b) What design considerations is assumed in design of foundation for off - shore structures ? 5

10. (a) Define the following terms : 3

(i) Ultimate Bearing Capacity

(ii) Safe Bearing Capacity

(iii) Net Bearing Capacity

(b) A strip footing is required to carry a total load of 1000 kN/m at a depth of 1.0m. Shear strength parameters for the soil are $c = 0$, $\phi = 36°$. Determine the minimum width of footing for a factor of safety of 3 against shear failure. The water table may rise upto the base of the footing (Assume ; $N_c = 50.58$, $N_q = 37.75$, $N_r = 56.31$, $\gamma = 16\ kN/m^3$ and $\gamma_{sat} = 19.93\ kN/m^3$) [Use Terzaghi's Bearing Capacity equation , take Factor of Safety = 3] 7