U.S.N | | | | | | | | | | |

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

(An Autonomous Institution affiliated to VTU, Belgaum)

Eighth Semester, B.E. – Civil Engineering

Semester End Examination; June/July - 2015

Advanced Foundation Design

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer any **FIVE** full questions selecting at least **TWO** full questions from each part.*
ii) Any missing data may be suitably assumed

PART - A

1 a. Discuss the effects of seasonal moisture changes, bearing capacity, neighboring structure and sloping ground on the selection of depth of foundation. 8

b. A square footing, 2 m side is proposed on a 10 m thick soil layer, made of normally consolidated saturated clay, to carry a load of 800 kN. Estimate the total settlement using the following details. Water content = 30%, Liquid limit = 80%, saturated unit weight = 18 kN/m^3, soil modulus = 24 MPa: Poisons ratio = 0.3, Influence factor = 0.87, coefficient of secondary compression = 0.0002. A laboratory sample, 48 mm thick with double drainage facility, experienced complete consolidation under same pressure, is two hours life span of structure = 150 years. Assume single drainage from top in the field. If permissible settlement is 60 mm by considering G = 2.7. 12

2 a. Explain the procedure for proportioning of footing for equal settlement. 6

b. What are the situations, under which, raft foundation becomes essential. 6

c. Proportion a combined footing for the following details, two columns, 300 mm x 300 mm in size spaced 3 m centre to centre carry loads of 600 kN and 400 kN. The footing can not extend beyond the edges of the column length wise. Allowable bearing pressure = 100 kPa. 8

3 a. What are the situations warranting pile foundations? 6

b. Briefly explain negative skin friction of piles. 4

c. A 350 mm x 350 mm reinforced concrete pile 20 m long is driven through loose material and then into dense gravel to a final set of 3 mm / blow, using a 30 kN single acting hammer with a stroke of 1.5 m. Determine the ultimate driving resistance of the pile if it is fitted with a helmet, plastic dolly and some packing on the top of the pile. The weight of the helmet and dolly is 5 kN. The other details are : 10

Weight of pile = 60 kN; weight of hammer = 30 kN; pile hammer efficiency η_h = 0.85; the coefficient of restitution, e = 0.38; sum of the elastic compression of the pile cap, pile material and soil is 19.6 mm.

Contd…2

4 a. What are the components of a well foundation? Explain them briefly with neat sketch. 10

b. With appropriate sketches, discuss the causes and remedies for tilt and shift of well foundation during sinking. 10

PART - B

5 a. What is a caisson? How caissons are classified based on the method of construction? 4

b. What is a floating caisson? How is its stability checked? 8

c. Determine the cross sectional dimensions of a cylindrical open caisson to be sunk through 33 m of sand and water to bed rock if the allowable bearing pressure is 1800 kN/m^2. The caisson has to support a load of 55 MN from the superstructure. Test the feasibility of sinking if the skin friction is 30 kN/m^2. Also calculate the necessary thickness of the seal. Assume $\gamma_e = 24\ kN/m^2$ and $\gamma_w = 10\ kN/m^2$. 8

6 a. Discuss the method of identifying expensive soil from laboratory tests. 6

b. What are the different methods of foundation treatment for structure on expansive soil? Explain any two of them. 8

c. Determine the capacity of 4.0 m long single bulb of 50 cm stem diameter. Average cohesion value both within the shaft of pile depth and below the toe is 100 kN/m^2. 6

7 a. Derive the expression for natural frequency of un-damped free vibration of single degree of freedom system. 8

b. Discuss the criteria for the design of foundation for reciprocating machine. 6

c. In a factory, a rotary machine having a frequency of 2000 rpm is proposed. Suggest method of vibration isolation and control, for its foundation. 6

8 a. Write a note on the design criteria for the foundation of a tall chimney. 10

b. Explain the foundation design procedure for Antenna and radars. 10

* * * * *