Register Number: ……………………

M.E.DEGREE EXAMINATIONS: APRIL / MAY 2010

Second Semester

STRUCTURAL ENGINEERING

SEE506: Design of Substructures

(All relevant codes permitted)

Time: Three Hours   **Maximum Marks: 100**

Answer ALL Questions:

PART A (10 x 2= 20 Marks)

1. Is the sample obtained using Split spoon sampler is undisturbed? Why?

2. Why SPT values recorded at different depths are corrected for overburden?

3. Under what circumstances combined footing is preferred?

4. Define buoyancy raft and true buoyancy raft.

5. What is friction pile?

6. How is spacing of piles decided?

7. What is floating caisson?

8. List the types of anchors used for foundation excavations.

9. How spring constant k can be related for the various modes of vibration?

10. Define the term restitution of impact.

PART B (5 x 16 = 80 Marks)

11. (a) Explain the seismic refraction method of soil exploration in a layered soil. Compare its advantages over other Geophysical exploration methods.

(OR)

(b) (i) Explain wash boring method of advancing bore hole.   (8)

(ii) Describe the salient features of a good sub soil investigation report.   (8)

12. (a) Design a trapezoidal combined footing for two columns 5m apart. The exterior column of size 400x400mm carries a load of 800kN and interior column of size 500x500mm carries a load of 1100kN. Take allowable soil pressure as 120kN/m^2. Use M20 concrete and Fe415 steel.

(OR)

(b) (i) What are the causes and effects of differential settlement.   (6)

(ii) Explain flexible method of design of raft. (10)

13. (a) Determine the ultimate load capacity of a driven circular pipe pile. The following are the pile and soil data: Diameter of pile= 450mm, Length of pile= 22m, Cohesion of soil= 40kN/m^2, $\varphi_u = 0^0$, Saturated unit weight of soil=18.5kN/m^3. The soil is deep homogeneous clay and the ground water is at the level of the ground surface.

(OR)

(b) (i) Briefly explain settlement of pile group in sands, clays, and weak rocks. (12)

(ii) Explain lateral load capacity of piles. (4)

14.(a) A circular pneumatic caisson with 2.5mx2.5m square working chamber is to be sunk up to a depth of 30m to reach the bed rock for support. The allowable bearing capacity of the bed rock is 2400kN/m^2. Find the outside diameter of the caisson and the plug thickness when M25 grade concrete is used. Assume resistance to skin friction to be 12.5kN/m^2 during sinking.

(OR)

(b) Design a suitable tower foundation for a double circuit 144kV transmission line without any deviation. The foundation is to be located in cohesive soil with c_u= 17kN/m^2 and bearing capacity 270kN/m^2, consider γ= 15kN/m^3 and(for compution of uplift only) φ=38^0. The foundation is subjected to the loadings as follows:

Loadings on the foundation

Nature of Load	Loads in kN under condtion	
	N.C.	B.W.C.
Downward	220.0	300.0
Uplift	165.0	240.0
Shear in transverse direction	14.0	18.0
Shear in longitudinal direction	_	8.5

15. (a) Obtain the velocity of the tup of a forge hammer before impact and that of the anvil after impact, given the following:

Weight of the tup and die	= 15.50kN
Stroke of tup	= 900mm

Weight of anvil and frame	= 350kN
Efficiency of drop	= 0.85
Coefficient of restitution	=0.48
Steam pressure	= 700kN/m^2
Area of piston	= 0.132m^2

Determine the amplitudes of vibration of the foundation and anvil if the limiting natural frequency of the anvil is 255rad/s, and the two natural frequencies of the combined system are 270rad/s and 52rad/s.

(OR)

(b) The following data refer to a single cylinder reciprocating machine:

Crank radius	= 100mm
Length of connecting rod	= 300mm
Operating speed	= 1500rpm
Weight of reciprocating parts	= 45N
Weight of rotating parts	= 9N

Calculate the maximum unbalanced force generated by the machine.

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