## G 6519

M.E. DEGREE EXAMINATION, MAY/JUNE 2007.

Second Semester

Structural Engineering

ST 1652 — DESIGN OF SUBSTRUCTURES

(Regulation 2005)

Time : Three hours                                                    Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.    State any two methods of obtaining undisturbed samples in sandy deposits.

2.    Define rock quality designation in core sampling.

3.    Give the application of strap footing.

4.    Why mat foundations are over–designed?

5.    Mention the type of pile material for cold regions.

6.    Pile groups should be driven from the interior to outward – Why?

7.    Define 'scour depth' in the design of Caisson.

8.    Explain 'Caisson disease'.

9.    Define horizontal amplitude and rotating amplitude in the design of machine foundation.

10.   What are the damping parameters?

PART B — (5 × 16 = 80 marks)

11.   (a)   (i)    Briefly explain planning of an exploration program.                    (7)

            (ii)   Explain the method of marine sampling.                                (6)

            (iii)  Write about preservation of core samples.                             (3)

Or

(b) (i) Explain Geophysical method of indirect exploration. Also give the formula required to determine various thickness of subsurface layer. (12)

(ii) Critically comment on wash boring method and percussion boring method of direct exploration. (4)

12. (a) (i) How will you determine the depth of foundation? (2)

(ii) A square footing 1.5 m × 1.5 m is placed at a depth of 1.2 m below G.L. It is subjected to an eccentric load of 350 kN at an eccentricity of 0.2 m in the $X$-direction. The sub soil consists of a thick deposit of cohesive soil with $q_u = 200$ kN/m² and $\gamma = 18$ kN/m³. Determine the factor of safety against bearing capacity failure. (14)

Or

(b) Design a circular footing for a column 50 cm diameter carrying a load of 1200 kN. The safe bearing capacity of the soil is 180 kN/m². Use $M_{20}$ concrete and Fe 415 steel. Also give the structural details of the footing. (16)

13. (a) (i) What is called efficiency of pile group? How will you determine? (6)

(ii) A 4 × 4 pile group in a cohesive deposit having $q_u = 180$ kPa, carries a load of 10,000 kN. The piles are of 0.5 m in diameter. Determine the length and spacing, assuming F.S = 2.5. (10)

Or

(b) (i) What are the advantages of under reamed pile foundation? (4)

(ii) A column carrying a load of 2500 kN has to be supported by 4 piles, each of 30 cm × 30 cm size at a spacing of 100 cm $c/c$. The column size is 60 cm × 60 cm. Design the pile cap. Use $M_{20}$ concrete and Fe 415 steel. (12)

14. (a) (i) How will you determine 'grip length' in Caisson design? (4)

(ii) A circular Caisson has an inside diameter of 3.00 m. Determine the wall thickness to overcome a skin friction of 20 kPa, if it is 14 m long to sink under it's own weight. Assume the weight of concrete suitably. (12)

Or

Also give the
f subsurface
(12)

ssion boring
(4)

(2)

f 1.2 m below
) kN at an
consists of a
kN/m² and
ainst bearing
(14)

rying a load of
J/m². Use $M_{20}$
of the footing.
(16)

letermine? (6)

$q_u = 180$ kPa,
m in diameter.
.5.          (10)

lation?          (4)

orted by 4 piles,
: /c . The column
$l_{20}$ concrete and
(12)

ign?          (4)

n. Determine the
.Pa, if it is 14 m
·eight of concrete
(12)

(b)  (i)  Explain the principle of working of Pneumatic Caisson.          (8)

(ii)  A drilled Caisson 1 m dia., and 10 m long is constructed in clay having unit weight of 16 kN/m³ and $q_u = 75$ kN/m². Design the load carrying capacity of the drilled Caisson.          (8)

15.  (a)  (i)  How does the design of machine foundation differ from that of conventional shallow foundation?          (4)

(ii)  Explain the significance of spring mass system in machine foundation.          (6)

(iii)  Explain the role of Resonance in the design of machine foundation.          (6)

Or

(b)  (i)  Explain a method to determine the co-efficient of uniform compression in the soil for a machine foundation.          (4)

(ii)  Explain the vibration isolation technique with sketches.          (6)

(iii)  Give the design procedure for reciprocating type machines.          (6)

_____