# GUJARAT TECHNOLOGICAL UNIVERSITY PDDC - SEMESTER-V • EXAMINATION - WINTER 2013 

Subject Code: X50603<br>Subject Name: Foundation Engineering<br>Time: 10.30 am - $\mathbf{0 1 . 0 0} \mathbf{~ p m}$<br>\section*{Instructions:}<br>1. Attempt all questions.<br>2. Make suitable assumptions wherever necessary.<br>3. Figures to the right indicate full marks.<br>4. Use of Programmable calculator is strictly prohibited<br>5. Draw neat sketch wherever necessary

Date: 09-12-2013

Total Marks: 70
Q. 1 Choose the correct answer from the following:

If the actual value of the SPT $(\mathrm{N})$ is greater than 15 for fine sands below water table, the corrected value of N is $\qquad$
(i)
(a) $15+((\mathrm{N}+15) / 2)$
(b) $15-((\mathrm{N}+15) / 2)$
(c) $15+((\mathrm{N}-15) / 2)$
(d) $15+((15-\mathrm{N}) / 2)$
(ii) Area ratio is mathematically defined as $\qquad$
(a) $\left(\mathrm{D} 2^{2}-\mathrm{D} 1^{2}\right) / \mathrm{D} 1^{2}$ (b) (D2-D1)/D $1^{2}$ (c) $\left.\overline{(\mathrm{D} 2+\mathrm{D}} 1\right) / \mathrm{D} 2^{2}$ (d) $\left(\mathrm{D} 2^{2}+\mathrm{D} 1^{2}\right) / \mathrm{D} 2^{3}$

The permissible settlements is the maximum in the case of $\qquad$
(iii)
(a) Isolated footing on clay
(b) Raft on clay
(c) Isolated footing on sand
(d) Raft on sand

The bearing capacity of soil supporting a footing of size $3 \mathrm{~m} \times 3 \mathrm{~m}$ will not be affected by the presence of water table located at a depth below the base
(iv) of footing of $\qquad$
(a) 1.0
(b) 1.5 m
(c) 3.0 m
(d) 6.0 m

If the gross bearing capacity of strip footing 2.0 m wide located at a depth
(v) of 1.5 m in clay is $400 \mathrm{kN} / \mathrm{m}^{2}$, its net bearing capacity for $\gamma=20 \mathrm{kN} / \mathrm{m}^{2}$ is
(a) $370 \mathrm{kN} / \mathrm{m}^{2}$
(b) $380 \mathrm{kN} / \mathrm{m}^{2}$
(c) $390 \mathrm{kN} / \mathrm{m}^{2}$
(d) $360 \mathrm{kN} / \mathrm{m}^{2}$

The load carrying capacity of a pile depends upon the

## (vi)

(a) skin friction
(b) point resistance
(c) both (a) and (b)
(d) neither (a) nor (b)

A 300 mm diameter pile is driven 10 m into a homogeneous consolidated clay deposit. The safe load when the factor of safety is 2.5 , unit cohesion is
(vii) $40 \mathrm{kN} / \mathrm{m}^{2}$ and adhesion factor is 0.70 ,
(a) 150.8 kN
(b) 105.6 kN
(c) 215.4 kN
(d) 211.2 kN
Q. 2 (a) Explain Standard penetration test.
(b) A square footing 2.5 m X 2.5 m is built on a homogeneous bed of sand of density $19 \mathrm{kN} / \mathrm{m} 3$ having an angle of shearing resistance of $38^{\circ}$. The depth of foundation is 1.5 m below the ground surface. Calculate the safe load that can be applied on the footing with a factor of safety of 3. Take bearing capacity factors as $\mathrm{Nc}=27, \mathrm{Nq}=30, \mathrm{~N} \gamma=35$.

## OR

(b) Discuss effect of inclination of load and water table on bearing capacity
Q. 3 (a) Explain factors affecting bearing capacity in detail 07
(b) A strip footing 1 m wide and a square footing 1 m side are placed at a
depth of 1 m below the ground surface. The foundation soil has cohesion of 10 kPa , angle of friction of $27^{\circ}$ and unit weight of $18.2 \mathrm{kN} / \mathrm{m}^{3}$. Calculate the safe bearing capacity using IS:6403. Use factor of safety of 3 .

## OR

Q. 3 (a) A precast concrete pile $40 \mathrm{~cm} \times 40 \mathrm{~cm}$ is driven by a single acting steam

07 hammer .Estimate the allowable load using (a)Engineering News Record Formula (F.S.=6).(b)Hiley Formula(F.S.= 4).Use the following data:
(i) Maximum rated energy $=4000 \mathrm{kN}-\mathrm{cm}$
(ii) Weight of hammer $=40 \mathrm{kN}$
(iii) Length of pile $=15 \mathrm{~m}$
(iv) Efficiency of hammer $=0.83$
(v) Co-efficient of resistitution $=0.5$
(vi) Weight of pile cap $=3.5 \mathrm{kN}$
(vii) No. of blows for last $25 \mathrm{~mm}=8$
(viii) Modulus of elasticity of concrete $=2 \times 10^{7} \mathrm{kN} / \mathrm{m}^{2}$

Assume the other data, if necessary.
(b) Explain factors affecting selection of type of foundation
Q. 4 (a) Enlist boring methods and explain any one in detail. 07
(b) Explain the types of geosynthetics and its various applications in 07 foundation engineering.

## OR

Q. 4 (a) What are the effects of swelling of soils on buildings?
(b) Briefly explain Settlement of single pile and settlement of group of pile. 07
Q. 5 (a) A 40 cm square pre-cast RCC pile is driven by 9 m into a sandy bed. The
standard penetration test results, performed on this ground are given below
Depth(m) 1.5, 3, 4.5, 6, 7.5, 9, 10.5, 12
SPT-N 4, 6, 12, 14, 20, 24, 35, 39
Value
Compute the factor of safety available if 1000 kN of compressive load is applied on this pile.
(b) Explain General shear failure and Local shear failure with neat sketch.

## OR

Q. 5 (a) Explain Engineering News Record formula and Hileys formula for 07 estimating load carrying capacity of pile with necessary equations.
(b) Explain Plate load test.

