Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (CE)/SEP. SUPPLE/SEM-8/CE-801/4/2012

2012
ADVANCED FOUNDATION ENGINEERING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives in any *ten* of the following : $10 \times 1 = 10$

i) The condition under which Coulomb Formula is used for retaining wall is when

a) $\delta_r > \delta_m$ b) $\delta_r = \delta_m$

c) $\delta_r < \delta_m$ d) none of these.

where, δ_r = angle of resultant pressure P_R with normal to walls backface.

δ_m = Maximum angle of wall friction.

ii) Presence of water table in the backfill serves to increase the earth pressure due to

a) decrease in cohesion

b) increase in surcharge

c) increase in unit weight

d) increase in wall friction.

iii) The basic requirement in the Seismic Refraction method is that the wave velocity in the upper layer must be ..... that in the lower layer.

a) less than b) greater than

c) equal to d) twice.

iv) As per I.S. Code, the maximum allowable settlement for RCC multistoreyed building with raft foundation on plastic clay is

a) 50 mm b) 75 mm

c) 100 mm d) 125 mm.

v) It is a general practice to provide the face of a cantilever retaining wall with a small batter to compensate for the

a) Forward tilting b) Lateral sliding

c) Overturning d) Forward sliding.

vi) The negative skin friction or down drag of a pile is a phenomenon which occurs when

a) a compressible organic soil is found at pile tip

b) a soil layer surrounding a portion of the pile shaft settles more than pile

c) ground water table suddenly rises from pile tip to ground surface

d) a long pile is driven next to the short pile under consideration.

vii) A sheet pile wall may fail in any one of the following ways : Identify the wrong one.

a) Forward movement of base

b) Failure by shear

c) Failure by bending

d) Failure by anchors.

viii) When a retaining wall moves towards the backfill, then the pressure developed is

a) zero b) active

c) passive d) none of these.

ix) For developing zero tension at the heel, the resultant force on the base of a Retaining wall should pass through a point where eccentricity from the centre of the base with width b is

a) b/2 b) b/3

c) b/2 d) b.

x) An earthquake is said to be damaging when the Richter Number is

a) >8 b) 6 to 6.9

c) 5 to 5.9 d) <4.

xi) The SPT test is most frequently used to measure the

a) The shear strength of soft clays

b) Undrained strength of fissured clay

c) Relative density of granular soils

d) Consistency of clays.

xii) A cohesive soil is able to stand with a vertical face up to a depth $2Z_o$ without any lateral support. The expression for Z_o is

a) $\frac{4C\tan\alpha}{\gamma}$ b) $\frac{2C\tan\alpha}{\gamma}$

c) $\frac{4C^2\tan\alpha}{\gamma}$ d) $\frac{C\tan\alpha}{2\gamma}$.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Briefly describe the types of sub-surface information that the seismic refraction studies can provide.

3. Observed SPT test value in a deposit of fully submerged sand was 45 at a depth of 6.5 m. The average effective unit weight of the soil is 9.69 kN/m^3. The data given are a) hammer efficiency = 0.8; b) rod length correction factor = 0.9; c) borehole correction factor = 1.05. Determine the corrected SPT value for standard energy R_{es} = 60% ?

4. A square pile group passes through a recently constructed fill. The depth of the fill L_n = 3 m. the dia of the piles are 30 cm and the piles are spaced 90 cm centre to centre. If the soil is cohesive with q_u = 60 kN/m^2, and γ = 15kN/m^3, compute the total negative frictional load.

5. What do you understand by degrees of freedom ? Discuss different types of vibrations.

6. Show schematically the classification of bulkheads.

7. A soil profile has an active zone of expansive soil of 2.0 m. The liquid limit and average natural moisture content during construction seasons are 50% and 20% respectively. Determine free surface swell. Given that, for LL=50% and w=20%, $S_{(wfree)}$ = 3%.

GROUP – C

(Long Answer Type Questions)

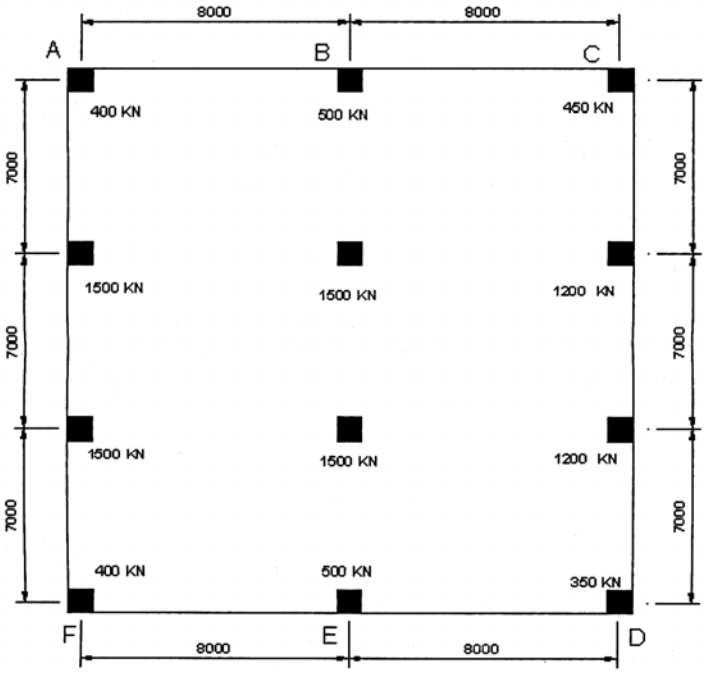
Answer any *three* of the following : $3 \times 15 = 45$

8. a) List the types and uses of retaining wall.

   b) By neat diagrams represent geometrical proportioning of different earth retaining structures.

   c) Reveal in short the different steps involved in designing footings for equal settlements.

9. A plan of mat foundation with column loads is shown in fig. below. Calculate the soil pressures at points A, B, C, D, E, and F. All the columns are 0.5 m × 0.5 m in section. Given that, $q_{net(all)}$ = 60 kN / m^2. Calculate the soil pressures and check the stability with respect to allowable bearing capacity. All the dimensions in the fig. are in mm.

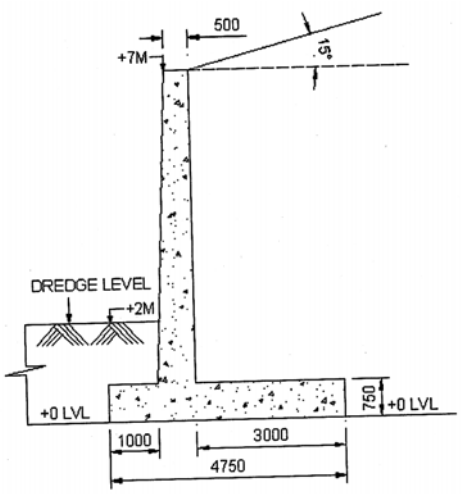


10. Check the stability of the retaining wall (shown in the figure below) with respect to

    a) Overturning

    b) Sliding

    c) Bearing capacity



All dimensions are in mm except mentioned

Following are the soil properties :

Properties	**Foundation soil**	**Backfull soil**
γ	19 kN / m^3	18.5 kN / m^3
ϕ	25°	30°
C	60 kN / m^2	0

11. Determine force in the tie rod of anchored sheet pile, anchored at a point 1.0 m below the top, supporting sides of an excavation 5.0 m deep in dry sandy soil having ϕ = 30°, G = 2.6 and e = 1.0 in back and water to a height of 3m in

front from dredge level. Assuming free earth support, also calculate the depth of penetration of the sheet pile. Detailed solution of cubical equation, if any should be given.

12. Design a gravity retaining wall, 5m high with vertical back to retain a dry cohesion less backfill of unit weight 18kN / m^3 and angle of shearing resistance 30°. Find also the factor of safety against sliding assuming angle of friction between the base of the wall and the foundation soil as 30°. The wall is to be 1 m wide at top, and to be constructed of brick masonry having unit weight 20kN / m^3. Use Rankine's theory for design.

NB.: Answers should be short and snappy.

Be tidy in writing your answers.