Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC-Semester –IV (May-2012) Examination

Subject code: X40603

Subject Name: Soil Engineering

Date: 10/05/2012

Time: 02.30 pm – 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **Choose right option of followings:** **20**

(i) Newmark's chart is used in foundation engineering to find
(a)Stresses in soil due to surface loading (b)Seepage loss
(c) Earth pressure (d)permeability of soil

(ii) The intensity of vertical pressure directly below a concentrated loading *P* kN at a depth of *y* meters in a soil mass is
$(a)\frac{3P}{2\pi y^2}(b)\frac{2\pi Py^2}{3}$ $(c)\frac{3P}{2\pi y^3}(d)\frac{3P}{2\pi y}$

(iii) In a slope stability analysis by friction circle method, the radius of friction or ϕ circle is given by
(a)$R\cdot\cos\phi$ (b)$R\cdot\sin\phi$ (c)$R\cdot\tan\phi$ (d)$C\cdot\mathrm{Sec}\phi$

(iv) Taylor's stability number is given by
$(a)\frac{F_c}{c\cdot\gamma\cdot H}(b)\frac{\gamma\cdot H}{c\cdot F_c}(c)\frac{c}{F_c.\gamma\cdot H}$ $(d)\frac{H}{c\cdot F_c\cdot\gamma}$

(v) For non cohesive soil, so long as the inclination of the infinite slope is less than the angle of shearing resistance ϕ the slope is
(a)stable for any height
(b) stable up to a certain height , called the critical height
(c) unstable for any height (d) none of above

(vi) For a base failure of a slope the depth factor *D* is
(a)Zero (b)1 (c) $0 < D < 1$ (d) $D > 1$

(vii) The factor of safety against sliding of a slope is
(a)The ratio of shear strength to shear stress along the surface
(b)the ratio of actual cohesion to that required to maintain stability of slope
(c)both (a) and (b)
(d)None of the above

(viii) The process of compaction of soil involves
(a) expulsion of pore water (b) expulsion of pore air
(c) expulsion of both pore air and pore water
(d) none of the above

(ix) Consolidation
(a) is a function of the total stress.
(b) is a function of the neutral stress.
(c) is a function of the effective stress.
(d) does not depend upon the present stress.

(x) The shear strength for a saturated clay from unconfined compression test is

(a) twice the unconfined compression strength
(b) half the unconfined compression strength
(c)Four times the unconfined compression strength.
(d) not related to the unconfined compression strength.

(xi) Settlement at any time to final settlement in a clay is known as:
(a) Settlement ratio (b) degree of consolidation
(c) Co-efficient of volume decrease (d) time factor

(xii) The unit of coefficient of consolidation are:
(a)cm^2/sec (b) cm^2/N(c) N/cm^2/sec (d) none of above

(xiii) Length to diameter ratio for cylindrical specimen of soils for triaxial shear tests is:
(a) 1.0 (b) 2.0 (c) 3.0 (c) 3.5

(xiv) When normal; stress is 100kN/m^2, the magnitude of shear stress on a principal plane is
(a) infinity (b) 100kN/m^2 (c) 200kN/m^2(d) nil

(xv) In shear box test, failure plane is the
(a) weakest plane (b) vertical plane
(c) major principal plane (d) horizontal plane

(xvi) With increase of angle of shearing resistance, coefficient of passive earth pressure:
(a) increase
(b) decreases
(c) remains constant
(d)none of the above

(xvii) Cohesive soils are:
(a) good for backfill because of low lateral pressure
(b) poor for backfill because of large lateral pressure
(c) good for backfill because of high shear strength
(d) none of the above

(xviii) According to Coulomb's wedge theory, the active earth pressure slides the wedge:
(a) downward and outward on a slip surface
(b) upward and inward on a slip surface
(c) horizontally inward parallel to base
(d) none of the above

(xix) The angle of internal friction is minimum for
(a) angular grained dense sand
(b) angular grained loose sand
(c) rounded grained dense sand
(d) none of the above

(xx) The ultimate angle of internal friction of a soil depends upon
(a) the amount of interlocking of particles
(b) the amount of friction between the particles
(c) both (a) and (b)
(d) none of the above

Q.2. A standard specimen of cohesionless sand was tested in triaxial compression and the sample failed at deviator stress of 482kN/m^2, when the cell pressure was 100kN/m^2, under drained conditions. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the major principle stress at failure for another identical specimen of sand if it is tested under a cell pressure of 200kN/m^2? **08**

OR

Q.2. In an unconfined compression test a sample of clay 100mm long and 50mm in diameter fails under a load of 150N at 10% strain. Calculate the shearing resistance taking into account the effect of change in cross-section of the sample. **08**

Q.3 (a) A rectangular raft of size 30x12m founded at a depth of 2.5m below the found surface is subjected to a uniform pressure of 150kPa. Assume the centre of the area is the origin of coordinates (0,0), and the corners have coordinates (6,15). Calculate stresses at a depth of 20m below the foundation level by the method of (a) Boussinesq, and (b) Westergaard at coordinates of (0,0),(0,15),(6,0) (6,15) and (10,25). Also determine the ratios of the stresses as obtained by the two methods. Neglect the effect of foundation depth on the stresses. **14**

OR

Q.3 (a) Explain Direct Shear Test **07**

(b) Explain Standard Proctor Test **07**

Q.4 Plot the compaction curve and obtain the maximum dry unit weight and optimum moisture content The following data refers to a compaction test as per Indian Standard. Take specific gravity of soil is 2.7. **14**

Water Content (%)	8.5	12.2	13.75	15.5	18.2	20.2
Weight of wet sample (kg)	1.80	1.94	2.00	2.05	2.03	1.98

OR

Q.4 A stratum of normally consolidated clay 7m thick is located at a depth 12m below ground level. The natural moisture content of the clay is 43percent and its liquid limit is 48percent .The specific gravity of the solid particles is 2.776. The water table is located at a depth 5m below ground surface. The soil is sand above the clay stratum. The submerged unit weight of the san is 11kN/m^3 and the same weighs 18kN/m^3 above the water table. The average increase in pressure at the center of the clay stratum is 120kN/m^2 due to the weight of a building that will be constructed on the san above the clay stratum. Estimate the expected settlement of the structure. **14**

Q.5 (a) Compare the Coulomb's theory with Rankine theory for lateral earth pressure **07**

(b) The infinite slope as shown in Fig.-1 is stable? If not, how much above the rock surface will the slip occur? **07**

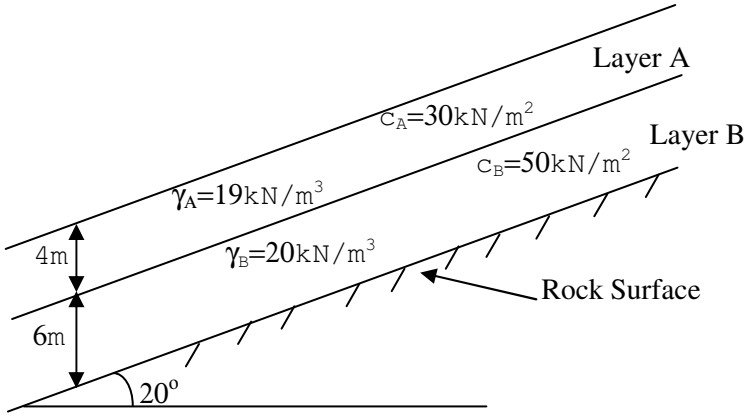

Fig.-1

OR

Q.5	**(a)**	A retaining wall, 7.5m high, retains a cohesionless backfill. The top 3m of the fill has init weight of 18kN/m^3 and ϕ=30° and the rest has init weight of 24kN/m^3 and ϕ=20°. Determine the pressure distribution on the wall.	**07**
	(b)	An infinitely long slope having an inclination of 26° in an area is underlain by firm cohesive soil (G=2.72 and e=0.50). There is a thin, weak layer of soil 6m below and parallel to the slope surface (c=25kN/m^2 ,ϕ'= 16°) Compute the factor of safety when the slope is dry. If ground – water flow could occur parallel to the slope on the ground surface, what factor safety would result?	**07**

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