CVL 321 : Geotechnical Engineering

Major Test (November 22, 2017)

Time: 2 hr

Max Marks: 44

Note: (1) Draw neat figures, wherever needed. (2) To compare, draw a center line and compare point-wise on two sides of this line.

Q.1 Give short answers to the following questions: (2x10=20)

(i) Draw a neat and labeled figure of cover of Municipal solid waste landfill showing dimensions. Also indicate possible locations of all geosynthetics that can be used and their primary function at that location.

(ii) Name the type of geogrids and arrange them in order of their stiffness (with one with highest stiffness at top).

(iii) How are geogrids different from woven geotextiles in terms of reinforcement function ?

(iv) Give any one example each of application of unidirectional geogrid and bi-directional geogrid.

(v) In dynamic compaction, if a weight of 50 kN is dropped from 10 m height, what is the likely depth of compaction ?

(vi) In what ways, do prefabricated vertical drains with surcharge achieve ground improvement ?

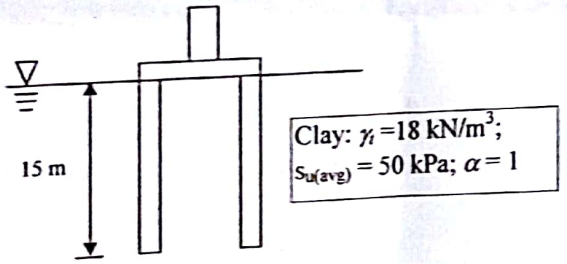
(vii) Compare permeation grouting, compaction grouting and jet grouting.

(viii) Draw a neat figure (both plan and cross-section) of a four stage construction of embankment for Ash Pond by upstream method.

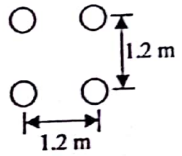
(ix) How do you obtain response spectra? What is its significance ?

(x) List all the components of an engineered landfill.

Q.2 Compute the axial capacity of the 4-pile group shown below. (6)
(Use $N_c = 9$; diameter of all piles = 600 mm)



SECTION



PLAN

Q.3 A 7 m high vertical wall supports a soil backfill with horizontal surface. The top 4 m of the backfill has bulk density of 17.6 kN/m^3, cohesion of 15 kN/m^2, and friction angle of 20^0. The saturated density, cohesion and friction angle of the bottom 3 m is 19.2 kN/m^3, 20 kN/m^2 and 30^0, respectively. Ground water table is at 4 m depth. Assuming that tension cracks develop, what will be the total lateral pressure (active earth pressure + water pressure) on the wall and its point of application ? Also draw the pressure distribution diagrams. (6)

Q.4 A machine weighting 8 kN is mounted over a foundation block with a base of 1.6 m^2 and a weight of 15 kN. The coefficient of elastic uniform compression for the subsoil and damping ratio are, respectively, 20000 kN/m^3 and 0.10. Determine the natural frequency, maximum amplitude of the system and the maximum force transmitted to the soil if the force of excitation is vertical and given by $F = 0.04\ \omega^2 \sin \omega t$ (N). (6)

PTO

Q.5 The slope shown below is subjected to a horizontal acceleration of 0.25 g. Determine the safety factor by the ordinary method of slices for **seismic case.** Neglect vertical acceleration. The following data are given. (6)

Soil A: $\gamma_t = 20$ kN/m^3, $c' = 2$ kPa, $\phi' = 30^0$;
Soil B: $\gamma_t = 20$ kN/m^3, $c' = 5$ kPa, $\phi' = 20^0$;
Width, B_i of all slices = 4 m; R = 30 m
L_i = Length of arm from horizontal seismic force to rotation center O (in m)

Slice No.	8	7	6	5	4	3	2	1
Weight W_i of slice (kN/m)	90	300	400	500	550	450	400	130
Base angle, α_i of slice	45	35	25	20	15	5	-5	-10
L_i, Arm length of horizontal seismic force (m)	14.1	15.2	16.4	17.8	18.8	19.2	19.3	19.8