College of Engineering, Pune
End Semester Exam – May 2012
F.Y. M.Tech (Civil) Geotechnical Engineering
GE- 506 - Soil Dynamics

Day & Date- Friday 11 May 2012 Time: - 9.00 to 12.00
Maximum Marks: 50 Duration – 3 hrs.

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Draw neat figures wherever necessary

Q. 1 A. A 8m retaining wall with back face inclined at 20^0 with vertical retains a cohesionless backfill with $\gamma = 18$ KN/m^3 , $\varphi = 30^0$ and $\delta = 20^0$. The backfill is inclined to the horizontal by 15^0. The wall is located in a seismic area where design seismic coefficients are $\alpha_h = 0.1$ & $\alpha_v = 0.05$. Compute the static and dynamic earth pressure on the wall using modified Culmann's method. (6)

B. Using method of impedance, obtain amplitude of motion of a MDF forced vibration damped system. (4)

Q. 2 A. A rotor of a motor having mass 3 kg was running at a constant speed of 30 cps with an eccentricity of 150mm. The motor was mounted on an isolator with damping factor of 0.2. Determine the stiffness of isolator spring such that 15 % of the unbalanced force is transmitted to the foundation. Also determine the magnitude of the transmitted force. (5)

B. With the help of neat sketch, explain how cyclic plate load test is used to measure the dynamic soil properties. (5)

Q. 3 A. Formulate the equations of motion for simultaneous rocking and sliding vibrations of a block foundation. Obtain the natural frequencies of this 2-DOF system. (10)

Q. 4 A. Obtain the first three normal modes for longitudinal vibrations of an elastic rod of finite length with fixed-free end conditions. (5)

B. State Navier's equations in Cartesian coordinates for waves propagating through an elastic medium. Hence deduce the expression for velocity of compressive wave and shear wave travelling in X-direction. (5)

Q. 5 A. A structure is observed to behave as a SDF system of mass 2 kg and (4)

stiffness 5 N/m. The ratio of successive amplitudes is found to be 1.2. Determine the value of hysteretic damping constant β, equivalent viscous damping constant c_{eq} and energy loss per cycle for an amplitude of 10 mm.

B. Stating the assumptions obtain the equation of motion to evaluate dynamic response of a continuous surface footing subjected to vertical transient load using Trianadafilidis approach. (6)

College of Engineering, Pune

M.Tech. (GT) Civil Engineering

CE (5306) Analysis and design of foundation Engg.

End Semester Exam

1) Solve any **Five** questions — Max. Marks-50

2) Draw necessary diagram wherever necessary — Duration – 3hrs.

Q1 a) Write short note on: **Effect of eccentric loading on bearing capacity** 05

b) The following data was obtained from plate load test carried out on a 60cm square test plate at a depth of 2m below ground surface on a sandy soil which extends upon a large depth 05

Load intensity t/m^2	0	5	10	15	20	25	30	35	40
Settlement (mm)	0	2.0	4.0	7.5	11	16.3	23.5	34	45

Determine the settlement of foundation 3.0x3.0m carrying load of 110 t and located at a depth of 2m below ground surface. Water table is located at a large depth from the ground surface.

Q2 a) Write short note on: Negative skin friction in piles 05

b) A group of 9 piles arranged in a square pattern with diameter and length of each pile 25cm and 10m respectively is used as a foundation in a soft clay deposit . Taking the unconfined compressive strength of clay as 120 kN/m^2 and pile spacing as 100 cm centre to centre , Find the load capacity of the group . Assume the bearing capacity factor Nc=9 and adhesion factor =0.75. The factor of safety 3.5 is taken. 05

Q3 a) State and explain Terzaghi's B.C equation 05

b) A rectangular footing has a size of 1.8mx3m has to transmit the load of a column at a depth of 1.5m Calculate the safe load which the footing can carry at a factor of safety of 3 against shear failure. Use **IS code method** . The soil has following properties 05

n = 40%, G=2.67, w=15%, c=8kN/m^2 and Φ = 32.5

Nc= 38.13.Nq=25.85 and Nr=35.21

Sc=Sq = 1+ 0.2 (B/L)

Sr= 1- 0.4 (B/L)

Depth factor =dc= 1+0.2 D/B $\sqrt{}$ (NΦ

dq=dr= 1+0.1D/B $\sqrt{}$ (NΦ

Q a) Explain different types of foundation settlement on clay and sandy soil 05

b) A concrete pile of 50cm diameter is driven to a depth of 20 m through a 05

layered system of sandy soil (c=0) The following data available.

Layer 1 – thickness =8m , γd= 16.5kN/m^3 e=0.6 and = 30^0

Layer 2= Thickness = 6 m, γd=15.5 kN/m^3, e=0.65 and = 35^0

Layer 3=Extends to a great depth , γd= 16kN/m^3 ,e=0.65 and = 38^0

Assume that the value of in all the layers of sand is equal to 0.75 The value of $\overline{Ks}$ for each layer as equal to half of the passive earth pressure coefficient . The water table is at ground level.

Calculate values of Qu and Qs with F.S. 2.5.

Q5. A) Explain "Pressuremetre test" 05

B) Explain convention rigid method of designing Mat foundation 05

Q6. A) Write note on

- Settlement of group of pile 05
- P-y method of solution of laterally loaded piles. 05

COLLEGE OF ENGINEERING PUNE

(Formerly Government College of Engineering, Pune)

END SEMESTER EXAMINATION May 2012

(GE 502) Soil Engineering II

Program : First Year M. Tech. (Civil)
Year: 2011-12; Semester II
Duration: 3hrs (09.00 AM to 12 Noon)

Specialization: Geotechnical Engineering
Date: 06.05.2012
Max. Marks: 50
Weightage – 100%

Instructions:

1. **All questions are compulsory.**
2. **Figures to right indicate full marks.**
3. **Draw neat figures wherever required.**
4. **Unless otherwise stated, symbol denotes standard meaning.**
5. **Mobile phones and Programmable Calculators are not permitted.**

Q 1 A) Explain soil stabilization with reference to the following points.
(a) Definition, (b) Types, (c) Scope, (d) Uses, (e) Enumerate common methods and (f) Construction aspects. (06)

B) Explain durability aspects of stabilized soils. (02)

C) Explain physico-chemical study of soil stabilization. (02)

Q 2 A) Explain in detail with neat sketches the concept of Roscoe Surface for drained and un-drained soil sample tests. (06)

B) For ideal elastic soil under axial symmetric case, derive relationships between
(a) $\delta\varepsilon_v$ and $\delta p'$
(b) $\delta\varepsilon_s$ and δq (04)

Q 3 A) Why p':q' space is preferred for the study of stress path (02)

B) Explain failure criteria for soils. (02)

C) Plot total and effective stress paths in p:q space for the following observations taken during tri-axial tests. All stresses are in kPa.

(a) Drained Test

σ_1	100	200	300	360	380
σ_3	100	100	100	100	100
u	50	50	50	50	50

(03)

(b) Un-drained Test

σ_1	100	180	220	260	280
σ_3	100	100	100	100	100
u	50	60	80	90	100

(03)

Q4 A) Explain with neat sketches the following terms.
(a) Straining hardening, (b) Yield curve, (c) Flow rule, and (d) Plastic potential (04)

B) What is dry and wet soil samples w. r. to critical state line? Explain the behaviour of such soils under drained shear test. (04)

C) What is cam clay? (02)

Q5 A) Explain bound theorms. (04)

B) A 2m wide strip footing of a retaining wall is provided at a foundation depth of 1.5m, on a foundation stratum having $\gamma = 20kN/m^3$, $c=0$ and $\varphi=30^o$. The soil above foundation stratum is having $\gamma = 18kN/m^3$, $c=0$ and $\varphi=25^o$. Using both upper and lower bound, determine the bearing load. (06)

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