Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 714302N **Date: 04-06-2013**

Subject Name: Soil Dynamics

Time: 10.30 am – 01.00 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 **(a)** Describe the effect of the following on the strength of clayey soils. **07**

(i) Number of pulses of loading

(ii) Loading time

(iii) Static stress level and dynamic stress level

(b) The following tests were performed at ground surface to determine dynamic modulus of elasticity, coefficient of elastic uniform compression Cu, coefficient of elastic uniform shear $C_{ŭ}$ coefficient of elastic non-uniform compression $C_{ū}$, coefficient of elastic non-uniform shear C_{Q}, for the design of compression foundation of size 3m x 3.5m x 2m high. Size of test block 1.5m x 0.75m x 0.75m high. At frequencies 35 and 46, the amplitude is 13/ã2.Find damping coefficient. **07**

Vertical vibration test data:

Sr.No.	Angle of setting of eccentric masses	Frequency at resonance	Amplitude at resonance(micron)
1	30	41	13
2	45	40	24

Q.2 **(a)** A cyclic plate load test was performed on 60cm x 60cm size plate. The elastic rebound observed are as under: **07**

Load intensity(t/m^2)	10	20	40	60	80
Rebound in (mm)	0.3	0.53	0.74	1.1	2.0

Using this data obtain following: Cu, CŰ Cű, C_{Q}, E and G for foundation block of size 4m x 3m.

(b) Enumerate methods of assessing liquefaction potential of a soil of a project site. Explain any one in detail you feel most reliable. **07**

OR

(b) At a given site in Vatwa area of Ahmedabad, bore hole drilled upto 10m depth revealed following: **07**

Depth(m)	Classification of soil	D_{50}	N value	N corrected	Relative density (%)
2	SP	0.18	5	6	35
4	SP	0.20	8	9	40
6	SM	0.16	10	11	40
8	SP	0.18	14	14	50
10	SP	0.20	16	16	52

The earthquake of magnitude 7.5 is likely to occur in future. Determine the zone of liquefaction by using seed method or by Iwasakis method. Water table is located at 2m below G.L. γ_{moist} = 19KN/m^3 and γ_{sub} = 10KN/m^3.

Q.3 **(a)** Giving steps discuss in detail the pseudo-static analysis of designing footing for dynamic loading. In what way this method differs from dynamic analysis, also give critical comment on dynamic bearing capacity of footing. **07**

(b) Differentiate between Cohesionless and cohesive soils in relation to resistance to horizontal dynamic load. **07**

OR

(b) A retaining wall 8m high is inclined 10° to vertical and retains horizontal backfill with following properties. ɔ$_b$=18 KN/m^3, ū =30° and c=8 KN/m^2.A surcharge load of 20 KN/m^2 is placed on the backfill. The wall is in seismic zone having Ŭ$_h$=0.1. Compute dynamic active earth pressure and the percentage increase in pressure over static earth pressure. Show the point of application of these pressures with reason. Would you recommend the inclination of wall towards or away from fill? Justify your answer. **07**

Q.4 **(a)** State the possible damage due to liquefaction due to earthquake. Discuss in brief the measures for preventing possibility of liquefaction. **07**

(b) Critically discuss the stability of retaining wall for earthquake conditions. **07**

OR

Q.4 **(a)** Derive expression for the free vibration response of damped SDOF structural system & differentiate the response with that of free un-damped response. **07**

(b) For the two storey building frame having lumped masses 2500 kg at floor level having first storey stiffness 70 kN/m & ground storey stiffness 45 kN/m. Draw all mode shapes, interpret the result of the mode shape give your expert comment. **07**

Q.5 **(a)** A simply supported beam of negligible mass spanning 10 m supports a machine of 80 kN at center with an unbalanced rotor applying a vertical force of 150 sin 20t kN. The damping force is 0.5 kN-s/m & Flexural rigidity of beam is 60000 kN-m2. Determine (i) maximum amplitude of vibration (ii) amplitude of vibration at resonance. **07**

(b) Explain construction aspects of Machine Foundation **07**

OR

Q.5 **(a)** Explain the concept of Active & Passive isolation in detail **07**

(b) A SDOF vibrating system is having following parameters. **07**
m = 30 kg, k = 140 N/m, c = 20 N ï sec / m. Determine (i) the damping factor (ii) the natural frequency of damped vibration (iii) logarithmic decrement (iv) the ratio of two successive amplitudes & (v) the number of cycles after which the original amplitude is reduced to 60%.

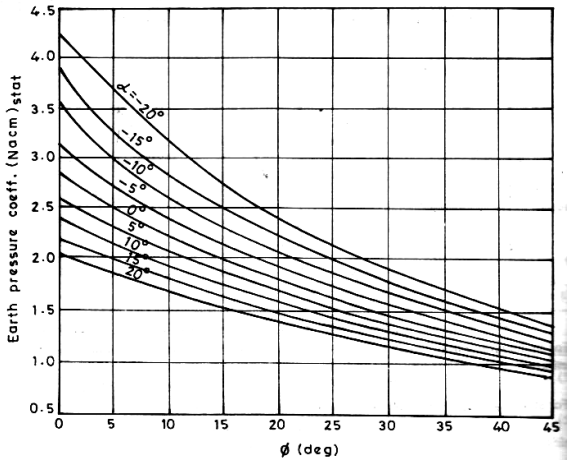
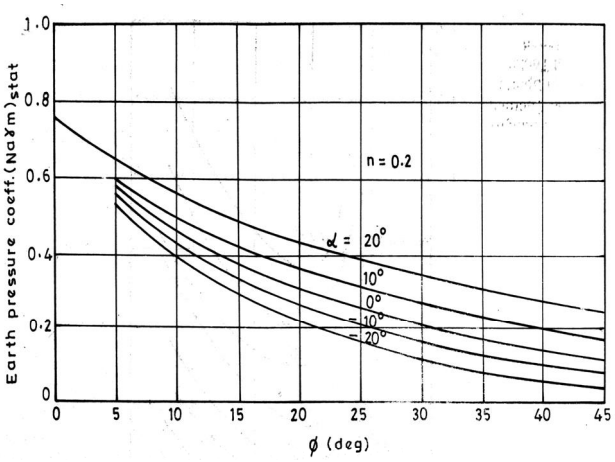


Chart-1



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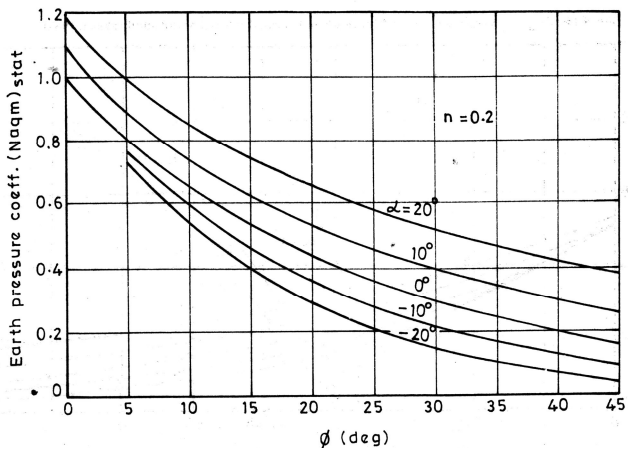

Chart- 3

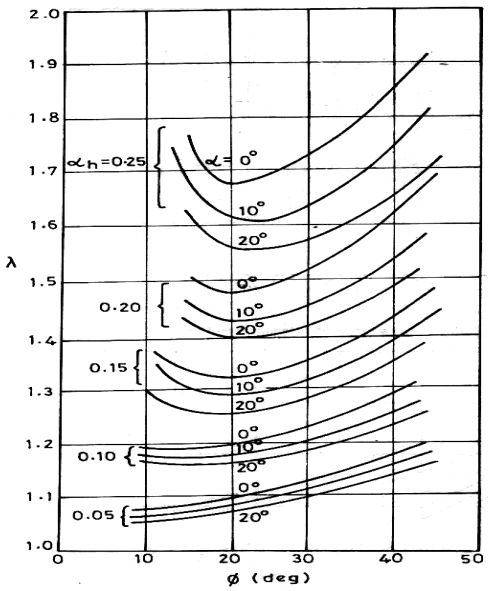

Chart-4

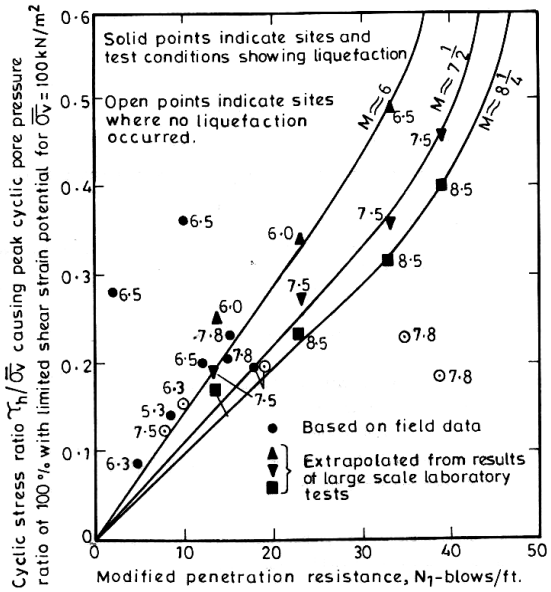

Chart-5