

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 714302N**Date: 17-06-2014****Subject Name: Soil Dynamics****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.
4. Use Charts 1-5 wherever necessary.

Q.1 (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.2 (a) Attempt following **07**

1. Explain mathematical modeling with examples.
2. What is the natural period of vibration of the second system with respect to first if both systems are identical except support condition? First system has hinge support & second system has fixed support.
3. What is the natural period of vibration of the second system with respect to first if both systems are identical except height? Take $h_1 = 2h_2$

(b) A SDOF vibrating system is having following parameters. **07**
 $m = 30 \text{ kg}$, $k = 140 \text{ N/m}$, $c = 20 \text{ N sec / m}$. 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%.

OR

(b) A simply supported beam of negligible mass spanning 20 m supports a machine of 50 kN at center with an unbalanced rotor applying a vertical force of $150 \sin 20t$ kN. The damping force is 0.4 kN-s/m & Flexural rigidity of beam is 50000 kN-m². Determine (i) maximum amplitude of vibration (ii) amplitude of vibration at resonance **07**

Q.3 (a) Explain the concept of Active & Passive isolation in detail. **07**

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

OR

Q.3 (a) Differentiate between Cohesionless and cohesive soils in relation to resistance to horizontal dynamic load. **07**

(b) 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: C_u , C , C_c , C_s , E and G for foundation block of size 4m x 3m.

- 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)** Define flow liquefaction and cyclic mobility of soils. Explaining mechanism of liquefaction & discuss factors affecting liquefaction potential of a soil. Can cohesive soil liquefy? Give reason for your answer. **07**

OR

- Q.4** At a given site in Vatva area of Ahmedabad, bore hole drilled up to 10m depth revealed following: **14**

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. $\gamma_{\text{moist}} = 19\text{KN/m}^3$ and $\gamma_{\text{sub}} = 10\text{KN/m}^3$.

- Q.5 (a)** Critically discuss the stability of retaining wall for earthquake conditions. **07**
- (b)** 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**

OR

- Q.5** A retaining wall 8m high is inclined 10° to vertical and retains horizontal backfill with following properties. $b=18\text{ KN/m}^3$, $\phi=30^\circ$ and $c=8\text{ KN/m}^2$. A surcharge load of 20 KN/m^2 is placed on the backfill. The wall is in seismic zone having $h=0.1$. 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. **14**

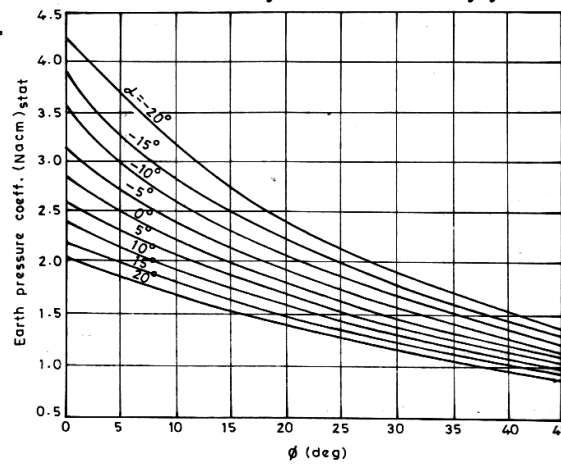


Chart-1

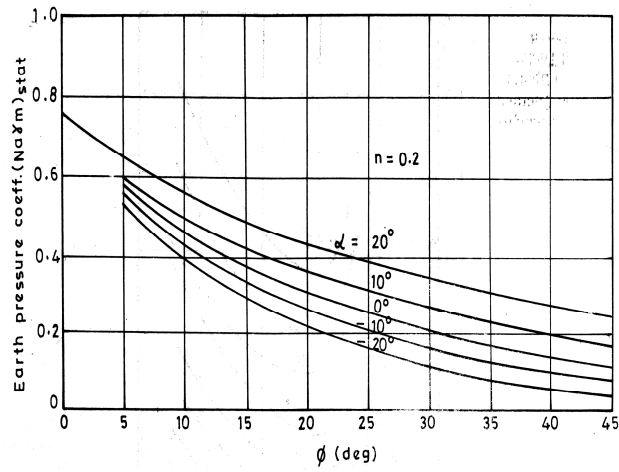


Chart-2

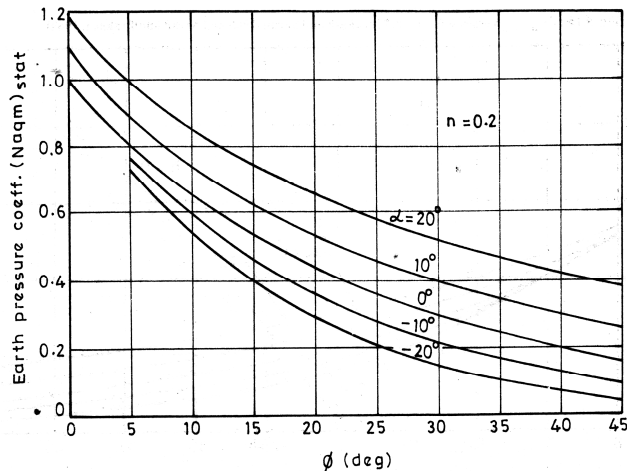


Chart-3

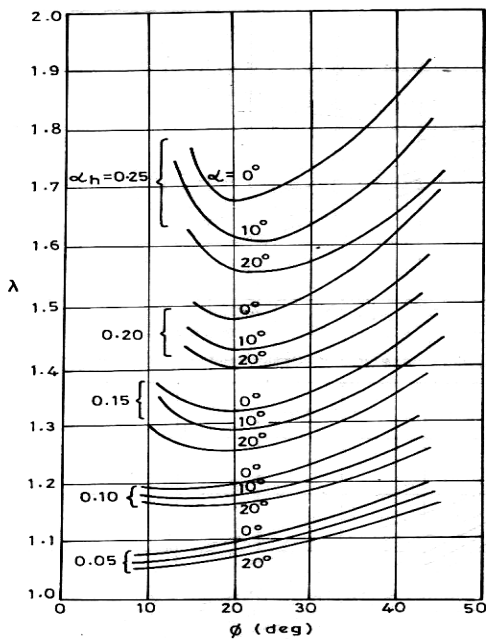


Chart-4

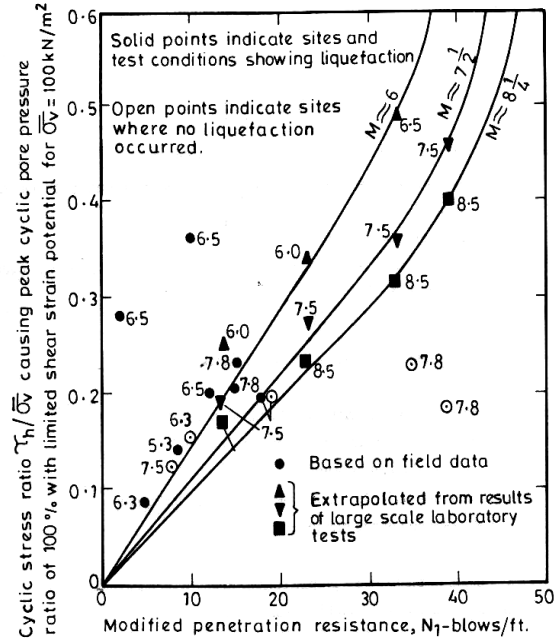


Chart-5
