Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–IV • EXAMINATION – SUMMER • 2014

Subject Code: 742001 Date: 04-06-2014

Subject Name: Soil Structure Interaction

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 **(a)** Define liquefaction. Explain any two techniques of mitigating liquefaction potential. **07**

(b) Compare the conventional i.e. rigid methods of analysis of foundations with the flexible methods involved in the soil structure interaction. **07**

Q.2 **(a)** Describe any two laboratory and two field tests for finding the dynamic soil properties. **07**

(b) A block vibration test was performed on a concrete block of 1mx1mx1m using vertical excitation. If the density of concrete block is 24 kN/m^3 , Determine C_u and damping coefficient for the given data:- **07**

Frequency(rpm)	500	600	700	750	850	950	1000	1200
A_z(mm)	0.2	0.6	1.5	2.5	3.2	2.5	1.5	0.6

OR

(b) Calculate the cyclic stress ratio developed at the site for the given data:- **07**

Depth(m)	1.0	2.0	3.0	6.0	8.0	10.0	12.0
N	08	10	12	10	17	22	24
r_d	0.99	0.98	0.96	0.93	0.90	0.88	0.85

Take a_{max} = 0.3g, r_{sat} =18 kN/m^3 .GWT is touching the GL. Also check the liquefaction potential at a depth of 2.0 m if CRR is 0.18

Q.3 **(a)** What are the different factors affecting contact pressures under the spread footings? With neat sketches, explain effect of flexibility and rigidity of a footing on contact pressures distribution. **07**

(b) For an ordinary footing of finite rigidity (i.e. neither perfectly flexible nor perfectly rigid), explain that the structural design is dependent on both the loading as well as contact pressures, not on the contact pressures only. **07**

OR

Q.3 **(a)** For a perfectly flexible footing placed on sand or clay, how uniform settlements can be achieved? In which case the bending moment at centre will be maximum? **07**

(b) Define ñWinkler Hypothesisò, ñWinkler Modelò and mention limitations of the same. **07**

Q.4 **(a)** How rigidity/flexibility of the super structure will affect the differential settlements of footings? **07**

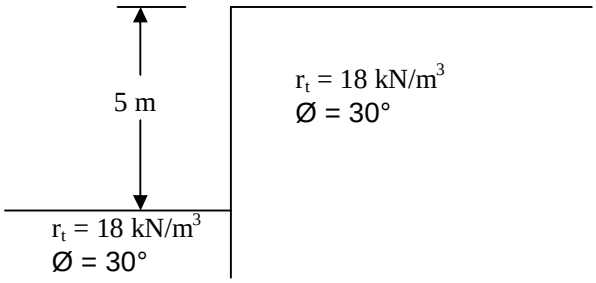
(b) A rectangular combined footing has L = 8.0 m, B = 1.50 m and EI = 2000 MN-m^2. One point load of 1.0 MN is acting at 2.00 m distance from the left edge and second point load of 1.0 MN is acting at 2.00 m from the right edge. Modulus of the subgrade for plate is determined to be 70 MN/m^3 within the clayey foundation soil. Divide the foundation in four elements and by Finite Difference Method (FDM), determine y (settlements), q (contact pressures), SF & BM values at the nodal points. **07**

OR

Q.4 **(a)** Explain the method of determination of ómodulus of subgrade reactionô and the factors affecting the same. **07**

(b) A rectangular combined footing has L = 6.0 m, B = 2.0 m and EI = 1800 MN-m^2. A 1.5 MN point load is acting at 1.50 m distance from the left edge and 2.0 MN point load is acting at 1.50 m from the right edge. Modulus of the subgrade for plate is determined to be 80 MN/m^3 within the clayey foundation soil. Divide the foundation in two elements only and by FDM, determine y (settlements), q (contact pressures), SF & BM values at the nodal & load points. **07**

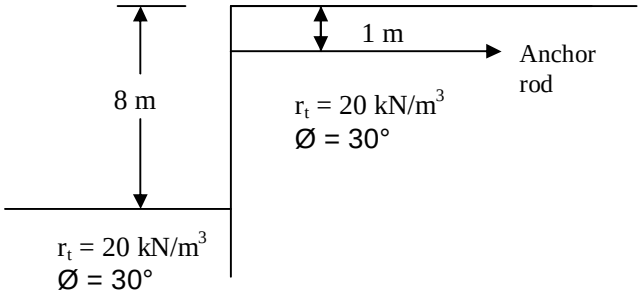
Q.5 **(a)** Find the depth of embedment for a cantilever sheet pile as shown in Fig. below:- **07**



(b) Draw the pressure distribution for a cantilever sheet pile embedded in sandy deposit by both simplified method and rigorous method. **07**

OR

Q.5 **(a)** Determine the depth of embedment for the case shown in Fig. below:- **07**
(use Free Earth Support method)



(b) Briefly describe the process of designing a reinforced wall for external and internal stability. The geogrid can be taken as the reinforcement. **07**

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