Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. Sem – IV Examination May 2011

Subject code: 742001

Subject Name: Soil Structure Interaction

Date:16/05/2011 **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)** 1) Differentiate between a Perfectly Flexible Footing (PFF) and Perfectly Rigid Footing (PRF) **03**

2) Show effect of magnitude of load on contact pressures and give necessary comments. **04**

(b) For perfectly flexible footings (PFF) placed on (i) CLAY & **07**

(ii) SAND, why settlement profiles are different? How uniform settlements can be achieved? Why the PFF cannot distribute the point load?

Q.2 **(a)** What are the different types of geosynthetics? Give with suitable sketches the various functions and applications of geosynthetics in civil engineering. Also define bearing capacity ratio. **07**

(b) 1) Comment: Rigidity of the super structure has restraining and redeeming influence on differential settlements. **05**

2) As per Bowles, why self weight of foundation should not be neglected in the foundation analysis? **02**

OR

(b) Enlist the different elastic methods of analysis for a beam on elastic foundation. In context of Hetenyi's solution, explain that Winkler's model is more reliable where criterion of design is allowable stresses, not the allowable deformations. State limitations of Hetenyi's method. **07**

Q.3 **(a)** A rectangular combined footing has L = 6.0 m, B = 1.50 m and EI = 1200 MN-m^2. One point load of 2.0 MN is acting at 1.5 m distance from the left edge and second point load of 1.5 MN is acting at 1.5 m from the right edge. Modulus of the subgrade for plate is determined to be 75 MN/m^3 within the clayey foundation soil. Divide the foundation in two elements only and by Finite Difference Method (FDM), determine y (settlement), q (contact pressure), SF & BM values at the nodal points. **10**

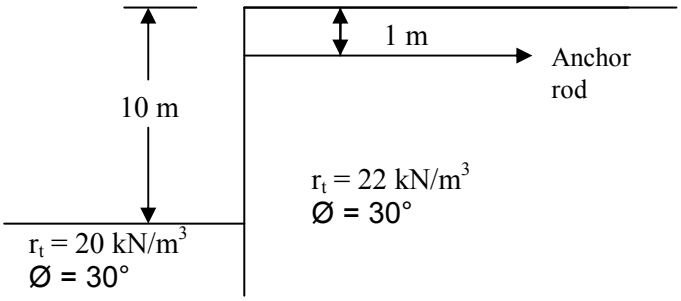
(b) Compare the results obtained in Q.3 (a) with the results obtained by Rigid method. **04**

OR

Q.3 **(a)** A rectangular combined footing has L = 6 m, B = 1.5 m and EI = 1500 MN-m^2. One 2 MN point load is acting at 1.5 m distance from the left edge and the second 2 MN point load is acting at 1.5 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 FOUR elements and by Finite Difference Method (FDM), determine y (settlement), q (contact pressure), SF & BM values at the nodal points. **10**

(b) Compare the results obtained in Q.3 (a) with the results obtained by Rigid method. **04**

Q.4 **(a)** Determine the depth of embedment and anchor rod force for the sheet pile as shown in Fig. below:- (use Free Earth Support method) **07**



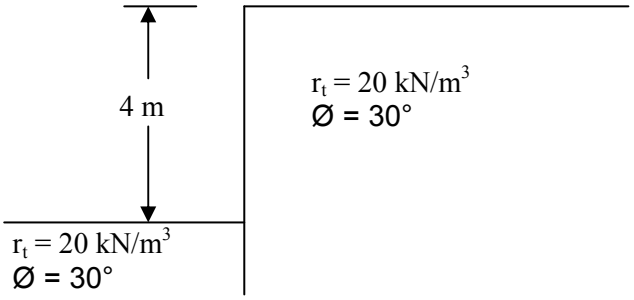
(b) Briefly explain the term 'Liquefaction'. **07**
Check the Liquefaction potential of a site for the given data:-

Depth(m)	1.0	2.0	3.5	6.0	9.0	12.0	15.0
N	06	08	07	05	12	18	22
r_d	0.99	0.98	0.97	0.95	0.90	0.84	0.75
CSR (τ_{av}/σ_0')	0.11	0.13	0.125	0.10	0.17	0.27	0.33

Take α = 0.2g, r_{sat} =16 kN/m^3 .GWT is touching the GL.
% fines = 15%

OR

Q.4 **(a)** Find the depth of embedment for a cantilever sheet pile as shown in Fig. below:- **07**



(b) Write down the construction procedure of constructing geotextile and geogrid wall. Step by step give the analysis for internal and external stability checks. **07**

Q.5 **(a)** Design a geotextile wall of height 5.0m for internal stability only having surcharge, q = 20 kPa. Sand (r_t =20 kN/m^3 and Ø = 34°) is to be used as a backfill material. The ultimate tensile strength of geotextile is 50 kN/m. **07**

(b) At a site a building is to be constructed on the soft clay bed (Cu = 50 kPa, Φu = 0.0, γ_t = 16 kN/m^3). If the width of the strip footing is 0.9 m, calculate the ultimate bearing capacity of the footing. If a sand band of 0.8B is placed over the soft clay with a geotextile at the interface, calculate the improvement in the bearing capacity. **07**

OR

Q.5 **(a)** Briefly explain the various techniques of finding out the Dynamic soil properties. How does geosynthetics help in modifying the dynamic soil properties? **07**

(b) Design a Reinforced Earth Wall (R.E.W.) of height 8 meters reinforced with Geogrid. Take C =0, Ø = 30°, r = 20 kN/m^3. The tensile strength of geogrid is 20 kN/m. **07**

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