Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**ME - SEMESTER– II(Old course) • EXAMINATION (Remedial) – WINTER- 2015**

**Subject Code: 1722005** **Date: 11/12/2015**

**Subject Name: Advanced Foundation Engineering**

**Time:2:30 pm to 5:00 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)** With neat sketches, explain important location and depth criteria for the foundations. **07**

**(b)** State different types of well foundations mentioning their relative merits and demerits. **07**

**Q.2** **(a)** What are the different types of shallow and deep foundations? Explain usefulness of each type. **07**

**(b)** Write a short note on under reamed piles. How is it better than uniform section pile? **07**

**OR**

**(b)** A 6.0 m diameter raft footing is placed at 2.0 m depth below the ground level (GL). Soil properties are $\gamma_t$ = 18 kN/m$^3$; $\gamma_{sat}$ = 20 kN/m$^3$ ; C = 20.0 kPa & ū = 28.0ę (Nc=25.80, Nq=14.72, Nr=16.72). Compute the safe bearing capacity values for the Ground Water Table (GWT) position at 2.0m below the GL. Use IS code method **07**

**Q.3** **(a)** Why Standard Penetration Test (SPT) is useful in granular soils? For the SPT i.e. N values observed in a 20.0 m thick sand deposit with $\gamma_t$ = 18 kN/m$^3$; $\gamma_{sat}$ = 20 kN/m$^3$ compute the corrected SPT values. The ground water table lies at 8.0 m depth. **07**

| Depth (m) | 1.0 | 2.0 | 5.0 | 8.0 | 15.0 |
|---|---|---|---|---|---|
| N / 30 cm | 06 | 11 | 16 | 21 | 35 |

**(b)** Data given: **07**

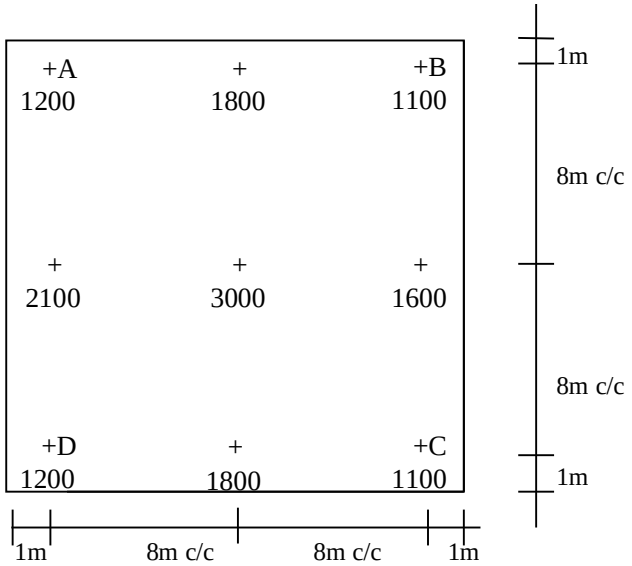
1. LHS column: 0.40m x 0.40m touching the property line on the left side. W1 = 1500 kN
2. RHS column: W2 = 1200 kN
3. c/c distance between column axes = 7.0 m
4. SBC = 220 kPa

Find size of the STRAP footing and draw shear force diagram mentioning typical values.

**OR**

**Q.3** **(a)** In the above Q.3 (b), consider SBC=120 kPa and find size of the TRAPEZOIDAL COMBINED footing and draw only shear force diagram mentioning typical values. **07**

**(b)** For a raft shown below, compute the contact pressure under the corner columns A, B, C & D. (Note: Loads are in kN and Fig. is not to the scale). **07**




**Q.4** **(a)** Briefly describe various methods of finding the lateral load carrying capacity of a pile. **07**

**(b)** A 3 x 3 = 9 pile group is embedded in uniform cohesive bed (Cu = 30 kPa, ū u = 0.0ę, ɔ$_{sat}$ = 20 kN/m$^3$, G = 2.70, ɔd = 18.0 kN/m$^3$, LL= 50 %). The piles diameter and length are 0.50 m and 12.0 m respectively. Calculate the settlement of the pile group under the applied load of 3000 kN. **07**

**OR**

**Q.4** **(a)** How do you find out the ultimate load carrying capacity of a pile from pile load test giving IS code recommendatios? **07**

**(b)** The following data was obtained in a vertical pile load test on a 400 mm diameter pile:- **07**

| Load(kN) | 5.0 | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 |
|---|---|---|---|---|---|---|---|
| Settlement(mm) | 2.5 | 4.0 | 9.5 | 16.5 | 27.0 | 40.5 | 61.0 |

Plot the load settlement curve and determine the allowable load as per IS code.

**Q.5** **(a)** What are different methods of finding dynamic soil properties? Describe any one laboratory or field technique. **07**

**(b)** The following data refers to a vertical resonance test carried out on a 1.5 m x 0.75 m x 0.70 m high (M15) concrete block. **07**

| f (cps) | 15 | 18 | 20 | 22 | 23 | 24 | 26 | 27 | 29 |
|---|---|---|---|---|---|---|---|---|---|
| Amp.(mm) | 0.03 | 0.05 | 0.08 | 0.15 | 0.20 | 0.22 | 0.18 | 0.16 | 0.13 |

Make a frequency-amplitude plot and compute the coefficient of elastic uniform compression, Cu and damping coefficient of the soil at site.

**OR**

**Q.5** **(a)** Explain óFrequency Ratioô, óMagnification Factorô and óDamping Factorô. What do you mean by Under damped and Critically damped conditions? **07**

**(b)** What are the problems for a foundation laid on expansive clayey soil? Explain a suitable technique of stabilization. **07**

**********