Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2724302 **Date: 08/12/2015**

Subject Name: Analysis & Design of Foundation Systems

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.**
4. **Use of Programmable calculator is strictly prohibited**
5. **Draw neat sketch/reinforcement detailing wherever necessary**
6. **Use of code IS 456 and SP 16 is permitted.**

Q.1 Explain the following with reasons in two-three lines: **14**

i. Why limit state method is considered to be more advantageous in foundation design? What are its limitations?

ii. What do you mean by pressure distribution diagram and what role it plays in case of retaining wall design? Why counterfort retaining wall is considered to be more stable compare to gravity retaining wall?

iii. What role type of foundation soil plays in design of footings? For isolated footing resting on clayey soils which type of pressure distribution is expected?

iv. What is basic principle of raft foundation? How its curbs differential settlement problems?

v. What is the load transfer mechanism for pile foundation? What role spacing of pile plays in case of end bearing piles and friction piles?

vi. Under which type of soil conditions well foundation is preferred? Which forces is dominant in case of well foundation design?

vii. What is the basic difference between conventional foundation design and design based on soil-structure interaction? Which is better?

Q.2(a) What do you mean by Winkler foundation? Explain with equations the finite difference method for design of beams resting on an elastic foundation. Show necessary calculations. **07**

Q.2(b) Elaborate the complete design of óunder reamô pile foundation with necessary calculations and sketches as per IS code. **07**

OR

Q.2(b) Write only design steps for design of well foundation. Assume suitable data of your own and support your answer with reinforcement detail sketch as per current practices. **07**

Q.3 Design a suitable raft foundation supporting the columns of a building of size 12m x 12m with column spaced at 4m interval. Service load transmitted by each column = 800 kN, size of column = 300mm x 300mm, take SBC of soil as 100 kN/m^2. Use M20 grade concrete and HYSD Fe415 steel. **14**

OR

Q.3 A RCC column of size 450mm x 450mm carries a characteristic load of 800kN. The safe bearing capacity of soil is 180kN/m^2. Design an isolated **14**

sloped footing. The materials are M20 grade concrete and HYSD reinforcement of grade Fe415 for both column and footing. Apply all necessary checks and show complete reinforcement detailing sketch.

Q.4 Design a gravity retaining wall to retain the earth 5.0m high. The top surface is horizontal behind the wall but subjected to a surcharge of 30 kN/m^2. The soil behind the wall is a well drained medium dense sand with ɔ = 18.4kN/m^3 angle of internal friction Ø = 31°. The material under the wall is the same as above with SBC of 160 kN/m^2. The coefficient of friction between base and soil is 0.55. Design the wall using M20 grade concrete and HYSD Fe415 steel. Show necessary stability checks and complete reinforcement details. **14**

OR

Q.4 Design a counterfort retaining wall with counterforts spaced 1.5m apart using M20 concrete and HYSD-Fe415 bars. Retaining wall is to hold an embankment of 6.0m height. The unit weight of the soil is 18.5kN/m^3 and angle of internal friction is 28°. The allowable bearing capacity of the soil on which retaining wall rests is 100 kN/m^2. Show necessary stability checks and complete reinforcement details. **14**

Q.5(a) A column 400mm x 400mm in section stands on a pile cap supported on three piles. The column is situated at the centroid of the pile group. The total load transferred to the column is 800kN. The piles are 1.4m c/c. Design pile cap. Use M20 grade concrete and Fe 415 steel. **07**

Q.5(b) Define mat foundation and state its one practical application. Which are common types of mat foundations? What is the basic difference between órigid methodô and óelastic plateô method for design of mat foundation? **07**

OR

Q.5 Design a slab beam type combined footing for the following data: **14**

Column	P1	P2
Size	300mm x 300mm	300mm x 300mm
Concrete	M20	M20
Main steel	4-20#	8-20#
DL & LL	460kN & 180kN	620kN & 160kN

The width of the base shall not exceed 2.0m. The safe bearing capacity of soil is 180 kN/m^2. Footing materials are M20 and HYSD-Fe415.