Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 1724302 **Date: 10/12/2015**

Subject Name: Analysis & Design of Foundation Systems

Time:2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **All Questions are compulsory.**
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(a) What do you understand by Winkler foundation? Narrate the various equations defined by Winkler for beams resting in elastic foundation with their neat diagrams. **07**

Q.1(b) Explain the suitability of pile foundations as per sub-soil conditions. Define under-ream pile and state its advantages. Explain with formula the load transfer mechanism for under-ream pile as per IS code. **07**

Q.2(a) Write only design steps for design of rectangular isolated footing of uniform thickness. Support your answer with reinforcement detail sketch as per current practices. **07**

Q.2(b) Enlist the various forces acting on well foundation. Explain in detail the analysis of various components of well foundation. **07**

OR

Q.2(b) Define mat foundation and state its one practical application. Which are common types of mat foundations? What is the basic difference between 'rigid method' and 'elastic plate' method for design of mat foundation? **07**

Q.3 Two columns C1 and C2 are the boundary columns of a building of size 7m x 16m in city area. Size of the columns is 230mm x 450mm spaced at 4m out to out. Column C1 and C2 carry 540 kN and 725 kN characteristics loads respectively. Design a strap footing for columns C1 and C2. SBC of soil is 220 kN/m^2. Use M20 grade concrete and HYSD Fe415. **14**

OR

Q.3 A 300mm x 600mm RCC column carries a service load of 900 kN and a service moment of 170 kN-m about its major axis. Design an isolated slab beam type foundation: main bars = 8-25Ø, ties = 8mm # @10mm c/c, allowable bearing capacity = 215 kN/m^2 at 1.5m depth. Use M20 grade concrete and HYSD Fe415. **14**

Q.4 Design a suitable raft foundation supporting the columns of a building of size 12m x 12m with column spaced at 3m interval. Service load transmitted by each column = 550 kN, size of column = 300mm x 300mm, take SBC of soil as 105 kN/m2. Use M20 grade concrete and HYSD Fe415 steel. **14**

OR

Q.4 A column 450mm x 450mm 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 1200kN. The piles are 1.5m c/c. Design pile cap. Use M20 grade concrete and Fe 415 steel. **14**

Q.5 Design a counterfort retaining wall with counterforts spaced 2m apart using M20 concrete and HYSD-Fe415 bars. Retaining wall is to hold an embankment of 5.5m height. The unit weight of the soil is 18.2kN/m^3 and angle of internal friction is 29°. The allowable bearing capacity of the soil on which retaining wall rests is 95 kN/m^2. Show necessary stability checks and complete reinforcement details. **14**

OR

Q.5 Design a gravity retaining wall to retain the earth 4.5m high. The top surface is horizontal behind the wall but subjected to a surcharge of 20 kN/m^2. The soil behind the wall is a well drained medium dense sand with γ = 17.8kN/m^3 angle of internal friction Ø = 28°. 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. **14**