

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER– 3 (NEW) • EXAMINATION – WINTER - 2023

Subject Code:3734305**Date: 02 Dec 2023****Subject Name:Analysis and Design of Foundation Systems****Time:10:30 AM TO 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.
4. Use of IS 456, SP 16, Steel table is permitted.

- Q.1 (a) Answer the following in short: (Any Seven) 14**
1. List any 5 types of shallow foundations with neat sketches.
 2. Enlist the conditions under which the Pile foundation is provided.
 3. What is the formula for approximate depth of foundation based on Rankine's formula. State the formula and name each parameter in that.
 4. Explain in brief the hybrid approach of foundation design adopted in most of the codes.
 5. Describe the External and Internal stability requirements of Cantilever retaining wall.
 6. Neatly draw the distribution of the bearing pressure along base of shallow foundation subjected to concentric vertical loads for following (a) rigid & flexible foundation resting on clay (b) rigid & flexible foundation resting on sand.
 7. At which location will you find out the bending moment for the following situations:
(a) Foundation of a brick wall
(b) Foundation for a Steel Column
(c) Foundation for a Pedestal
 8. Under which situations is a combined footing provided. Which are the two categories of combined footings.
 9. State the difference between Cantilever sheet pile wall and Anchored sheet pile wall.
- Q.2 (a) Explain Winkler Foundation. Provide solution for beams resting on elastic foundation. Support the proposed solution with necessary equation for Slope, Deflection, Moment and Shear force. 07**
- (b) Design a Plain concrete footing for a column size of 300 mm x 300mm carrying a service load of 290kN. Assume allowable soil pressure of 260kN/m² at 1.3 m below ground level. Use M20 and Fe415. 07**
- OR**
- (b) Design a RCC wall footing to carry a dead load of 120kN/m and a live load of 80 kN/m in working condition. The allowable soil pressure is 190 kN/m² at a depth of 1.5 m below ground. Density of soil is 20kN/m³. Use M20 and Fe415. 07**
- Q.3 (a) Design the combined footing connecting two columns A & B spaced 4 m centre to centre, carrying an ultimate axial load of 1000kN and 1400 kN respectively. The boundary line of the property is 400 mm from the outer face of the Column A. Column A is 360 mm x 360 mm and Column B is 420 mm x 420 mm. SBC of soil as obtained from plate load test is 106 kN/m². Use M20 and Fe415. 14**
- OR**
- Q.3 (a) Design a Slab Beam type strip footing for Column C1, C2, C3, C4 of size 420 mm x 420mm spaced at 5.0 m c/c and columns characteristic loads are 1020kN, 1250 kN, 950 kN, 1050kN respectively. Width of the footing is restricted to 2.5 m. SBC is 180 kN/m² , Use M20 & Fe415. 14**

- Q.4 (a)** Determine the dimensions, ultimate upward intensity of soil pressure and depth of footing considering the bending moment that will occur in the proportioned footing for a column carrying an ultimate load of 260 kN and ultimate moment of 64 kNm about an axis bisecting the depth of the column at its base. Size of the column is 250 mm x 600 mm reinforced with 6 bars of 20mm diameter. SBC of soil is 200 kN/m². Use M20 and Fe415. **07**
- (b)** Describe the following with respect to the Mat foundations: **07**
- (i) Uses of Mat foundation
 - (ii) Common types of Mat foundation
 - (iii) Factors influencing the settlement of mat foundations
- OR**
- Q.4 (a)** Design 12m long precast driven pile in cohesionless soil to a vertical load of 1600kN and a lateral load of 270kN at the top of the pile which is 0.4m above the ground surface. Assume modulus of subgrade reaction as 5.55 x 10⁴ kN/m³. **14**
- Q.5 (a)** The dimensions and the pressure distribution on the base of the cantilever retaining wall are mentioned below: Design and detail the Heel slab and the toe slab considering M20, Fe415 and earth weight as 19kN/m³. **14**
- Given data:**
- Base width – 3.5 m
 - Height of the stem – 5.5 m
 - Depth of the base slab – 500 mm
 - Thickness of the stem throughout – 250 mm
 - Length of the heel slab – 2.0 m
 - Pressure at the toe slab edge – 130 kN/m²
 - Pressure at the heel slab edge – 4 kN/m²
- OR**
- Q.5 (a)** 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 = 900 kN, size of column = 400mm x 400mm, take SBC of soil as 105 kN/m². Use M20 grade concrete and HYSD Fe415 steel. **14**
