BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
I Semester 2022-2023
Course: CE F313 Foundation Engineering
MID SEMESTER Examination
Duration: 90 MINUTES Dated: 31-10-2022 Weightage:30% Max. Marks: 60

Answer Part A and B in separate sheets. You can START Part B (open book) after submitting Part A answer sheets.

PARTA (CLOSED BOOK)

Q1. (a) List various procedures (lab/ field tests) for finding safe bearing capacity (SBC) of shallow foundations in sand. **(b)**What is the lowest cost testing procedure for finding safe bearing capacity and settlement of shallow foundation/combine footings with width ranging from 2 m to 5 m resting on dry deep deposit of loose to medium dense sand and why? Can we use direct shear test or triaxial test to find SBC for this case? If yes, which one is better and why? **[5 marks]**

Q2. Is it necessary to include earthquake forces in proportioning shallow foundations? Explain concept behind neglecting and/or including earthquake forces. Justify your answer by sample numerical data. **[4 mark]**

Q3. What are the limitations and disadvantages of plate load test? Explain each one. Draw neat sketches. In which cases plate load test may be better than SPT, SCPT or other tests and why? **[5 mark]**

Q4. What are the disadvantages of bored cast in-situ piles? List all. **[4 marks]**

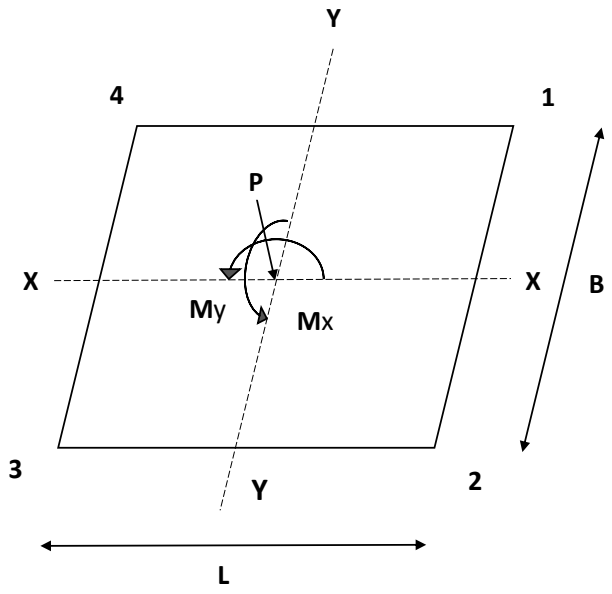
Q5. What are various guidelines /limitations are proposed by IS codes for footings resting on sloping ground? Give neat sketches. **[4 marks]**

PART B (OPEN BOOK)

Note: You are allowed to do Part B open book after submitting Part A answer sheets.

Q1. A bored cast-insitu concrete pile 50 cm in diameter is constructed in a homogeneous sand extending to a great depth. Estimate the length of pile for safe load of 1700 kN by IS:2911-2010. Angle of internal friction = 39°and unit weight of soil is 20 kN/m^3 above and below water table. Assume effective unit weight of sand at pile tip is 14 kN/m^3. Water table is at a depth of 6 m from ground level. [12 marks]

Q2. A rectangular footing 3 x 5 m (designed for the column whose centre coincides with the centre of footing) is subjected to biaxial moments of My=800 kN-m and Mx = 200 kN-m as well as vertical load of P=1000 kN. As per IS codes, allowable bearing pressure for sandy soil is 150 kPa and uplifting of footing is not allowed. Is footing safe? If not, what should be the revised dimension (increase only one side By or Bx) to make it safe for minimum area of footing? Also find pressure at all corners (1,2,3,4) of footing base after safe design. Draw the properly dimensioned plan of the foundation and pressure distribution. See Fig. [10 Marks]



Q3. Determine the net safe bearing capacity (as per IS6403-1981) of a rectangular footing 3 m x 4 m resting on sandy soil, located at depth of 1.5 m from ground surface. Design SPT value for footing is 38. Bulk and saturated unit weight of the soil is 20 kN/m^3 for above and below water table. The water table is at a depth of 1m from ground surface. Load is inclined at an angle of 10^0 to the vertical and is eccentric in the direction of width and length by 0.1 m and 0.8 m, respectively. Take factor of safety 2.5. **[12 Marks]**

Q4. Find the ultimate load capacity of 0.8 m diameter, 10 m long bored pile constructed in deep deposit of clay. Undrained shear strength of clay increases linearly from 60 kPa at ground level to 100 kPa at 10m depth from ground level. **[5 marks]**

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