BIRLA INSITUTE OF TECHNOLOGY AND SCIENCE, PILANI (RAJ.)
FIRST SEMESTER, 2023-2024
CE G620 ADVANCED FOUNDATIONS ENGINEERING
MID-SEMESTER EXAMINATION (Closed Book)
Duration: 90 minutes Dated: 13-10-2023 Max. Marks: 25

Only Formulae Sheet, tables, charts, graphs are Allowed.

Q.1 Draw the pressure distribution at the base of ring foundation for a water tank. The foundation has been subjected to vertical load (P) of 4800 kN and and Moment (M) of 6000 kN-m due to wind load. Outer and inner diameters of the ring foundation are 10 m, and 5 m respectively. Net allowable bearing pressure q_{all} is 200 kPa as IS codes. Check safety of foundation. If foundation is unsafe/ over safe, make it safe/ economical by changing inner/ outer diameter of foundation. Don't change ratio of outer diameter to inner diameter (i.e. 0.5). Draw pressure distribution after changing inner/outer diameter. **[6 marks]**

Q2. For a highway bridge fixed head reinforced concrete (M35) pile 1.1 m diameter in section is driven into a medium dense sand to a depth of 8 m. The sand is in a submerged state to find modulus of subgrade reaction lateral load test was conducted under free head condition, for a lateral load of 100 kN corresponding observed deflection of pile head is 14 mm. (a)find modulus of subgrade reaction (b) Compute the lateral deflection of the actual fixed head pile at ground level. **[5 marks]**

Q3. Design and detail a precast driven reinforced concrete circular pile (diameter = 0.5 m, Length = 10 m) subjected to a factored compressive load of 1750 kN and a factored moment of 220 kN-m. Use M25 mix concrete and Fe 500 grade steel. Assume d'/ D=0.2. Transverse reinforcement spacing less than 60 mm is not permitted. Use minimum possible size of longitudinal and lateral reinforcements. Assume other data suitably as per IS codes (IS2911 etc.). Draw neat sketch showing all details. **[5 marks]**

Q4. Find the safe thickness of the isolated rectangular footing by one-way shear (assume 0.25% steel), two-way shear and flexure for the column (size 500 mm x 500 mm) subjected to a factored axial force of Vu = 1000 kN and factored moment of Mu = 600 kNm due to earthquake. Assuming 2 m x 3 m size of foundation is worked out safe and center of column coincide with the center of footing. Take M 25 grade concrete and 18 mm bars of Fe 500 grade steel for both footing and column. **[6 marks]**

Q5. A rectangular footing 4 x 5 m (designed for the column whose center coincides with the center of footing) is subjected to biaxial moments of My=2100 kN-m (about an axis parallel to 4 m side and axis is passing through CG of footing) and Mx = 420 kN-m (about an axis parallel to 5 m side and axis is passing through CG of footing) as well as vertical load of 2100 kN. Assess whether the footing is under tension or compression. Find maximum pressure and contact area of footing. Draw the properly dimensioned plan of the foundation (with suitable depiction of zero pressure line) and pressure distribution. **[6 Marks]**

Paper Ends