BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

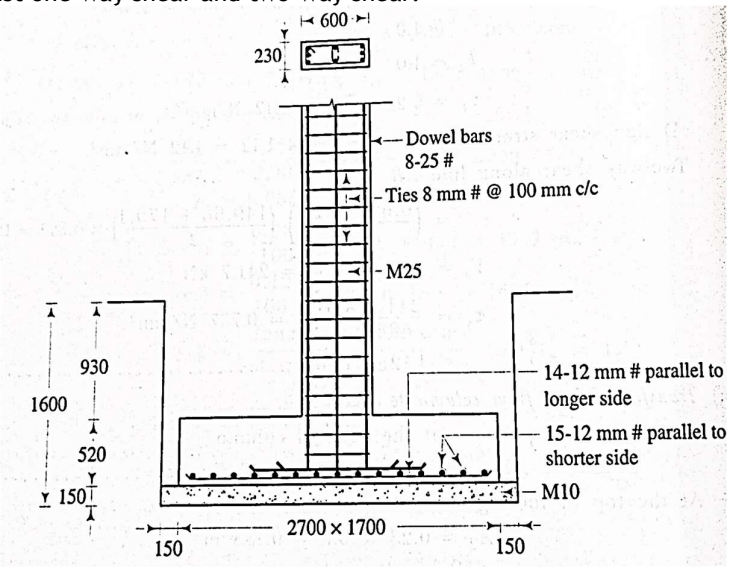
CLASS: M. TECH/PRE PHD **SEMESTER : II/PrePhd**
BRANCH: CIVIL **SESSION : SP/2023**

SUBJECT: CE549 STRUCTURAL DESIGN OF FOUNDATION

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Sketch the pressure distribution diagram for a rigid foundation on sandy and clayey soils and explain the reason for the difference in the pressure diagram between these two types of soils.	[5]	CO1	K3
Q.1(b)	An R.C.C column of size 350 mm x 350 mm is reinforced with 8-25 # bars of grade Fe 500. The concrete is M 25. It is loaded with an axial, unfactored load of 1800kN. A pad footing of size 3.15 m x 3.15 m and a thickness of 700 mm is provided. The allowable gross bearing capacity is 200 kN/m^2. Discuss and check for transfer of load from the column to the square footing if the grade of footing concrete is M20	[5]	CO4	K4
Q.2(a)	An isolated footing of size 2.7 m x 1.7 m is provided to support a 230 mm x 600 mm R.C.C column carrying a service load of 600 kN and a moment of 100 kNm about its major axis. Compute and sketch the net upward pressure for the footing design. Suggest the changes in footing size if any provided the net allowable bearing pressure is 160 kN/m^2.	[5]	CO2	K5
Q.2(b)	The figure below shows the reinforcement details for Q 2(a) for the soil with a gross allowable bearing capacity of 230 kN/m^2 at a depth of 1.6 m. Check if the footing is safe against one-way shear and two-way shear.	[5]	CO3 CO4	K3



Q.3(a)	Two columns C1 and C2 are the boundary columns of a building of size 6 m x 16 m in the city area. The size of the column is 230 mm x 500 mm spaced at 6 m out to out. Columns C1 and C2 carry 500 kN and 600 kN characteristics load respectively. The gross bearing pressure on soil is 200 kN/m^2. Proportion the plan of the strap footing for columns C1 and C2 such that the bearing pressure is not exceeded. The width of the footing is restricted to 2m.	[5]	CO2	K3
Q.3(b)	For the data in Q3(a), Determine the design bending moment of the strap beam. Also, highlight whether the moment will cause tension at the top or bottom.	[5]	CO2 CO4	K3

PTO

Q.4(a)	Interpret your conclusion on Case studies for foundation failure from the research article provided to you.	[5]	CO2	K2
Q.4(b)	Describe various types of raft slabs with sketches.	[5]	CO1	K1
Q.5(a)	A column of a multi-storeyed building is subjected to the following loads and moments. DL + LL : Vertical load= 2000 kN, moment, Mx = 150 kN-m, My = 90 kN-m EQ (x) : Vertical load= 80 kN, moment, My = 120 kN-m, Hx = 60 kN EQ (y) : Vertical load= 100 kN, moment, Mx = 160 kN-m, Hy = 80 kN The column is supported by a pile cap with 4 nos. 300 mm diameter piles spaced at 1.2 m centre to centre. The edge distance from centre of the pile is 350 mm. Determine the design forces in Pile.	[7]	CO4	K4
Q.5(b)	Determine the safe bearing capacities of piles with the following data: Diameter = 500mm Length 10m all Bearing capacity of soil at 10m depth = 8000kN/m^2 Average unit skin friction = 150 kN/m^2 Factor of safety = 3	[3]	CO2	K3

::::::28/04/2023::::::E