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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2016

Civil Engineering

(Geomechanics and Structures)

04 CE 6302- Design of Reinforced Concrete Foundations

Max. Marks : 60 **Duration: 3 Hours**

Relevant IS codes permitted

Answer all questions

PART A
(Each question carries 3 marks)

1. Brief on the soil pressure distribution on foundations under concentric and eccentric loads.
2. Describe the different types of combined footings using figures.
3. When do we provide raft foundations?
4. What are the factors influencing soil reaction on foundations?
5. What are the possible failure mechanisms of a pile cap?
6. What are infilled Virendeel frame foundations?
7. List the merits and demerits of providing shell foundations.
8. Describe with figure the stresses on a conical shell foundation.

(8 x 3 = 24)

PART B
(Each question carries 6 marks)

9. Design a reinforced concrete pedestal to support a steel column carrying a factored axial load of 1700kN. The base plate is 300mm square. Use M25 grade concrete and Fe 415 steel.

OR

10. Design a rectangular footing of uniform thickness for a column of size 300mm x 600mm carrying 1150kN axially. SBC of soil=200kN/m^2.

11. Two columns 500mm x 500mm are spaced 6m apart with the external column carrying 700kN and the internal column 1200kN. The external edge of the footing is not to be farther than 0.5m from the centre of the external column. Design the trapezoidal footing assuming SBC of soil as 150kN/m^2.

OR

12. Two columns 400mm x 400mm are spaced 3.2m apart and carry 1000kN each. If the width is restricted to 2m and the SBC of soil 200kN/m^2, design a ribbed footing to support the column loads.

13. Design a beam and slab raft for a layout of 13 columns with a 1.5m wide apron. The columns are arranged in 3 rows (3m apart), with 5 columns in the 2 exterior rows (each spaced 3m apart) and 3 columns in the interior row (spaced 6m apart). The columns in the exterior rows carry 400kN each, the 2 extreme columns in the interior row carry 600kN each and the central column carries 300kN. Assume that the factored base pressure on the raft is 66kN/m^2.

OR

14. How is the load from a water tank supported on 'n' columns transferred to the foundation?

15. Explain Elastic Half Space method of analysis of flexible footings.

OR

16. Find the bending moment and soil pressure on a slab 400mm thick and 4m wide supporting 5 columns spaced 5m apart and overhangs of 1m each on either end using ACI method. The 2 exterior columns carry 3000kN each and the interior columns 3500kN each. Assume coefficient of subgrade reaction as 38 x 10^3 kN/m^3.

17. Determine the cross-sectional dimensional of a symmetrical open caisson to be sunk through 33m of sand and water to the bed rock , if allowable bearing pressure is 1800 kN/m^2. Caisson has to support a load of 55x10^3 kN from super structure. Test the feasibility of sinking if skin friction is 30kN/m^2. Also calculate the necessary thickness of the seal.

OR

18. Design a pile cap using truss theory for a system of 3 piles supporting a column 500mm square, carrying an axial load of 600kN. Assume diameter of the pile as 300mm, f_{ck}=20N/mm^2 and f_y=415N/mm^2.

19. Design a hypar shell foundation for a column carrying a load of 1200kN if the SBC of soil is 60kN/m^2.

OR

20. Design suitable foundation for 20 degree angle tower to be used in a double circuit 132kW transmission line. The foundation is located in medium dense sand with ϕ = 30 degrees and γ = 17kN/m^3. Depth of the ground water table is 5m below ground level. Use overload factor of 2 and 1.5 for normal and broken wire conditions resp. The foundation is subjected to the following loadings.

Nature of load	**Load in kN**	
	N.C.	**B.W.C.**
Downward	400	450
Uplift	300	380
Shear in transverse	3.3	25
Shear in longitudinal	-	16

i. Design the RC shaft for tension combined with moment.

ii. Design the RC shaft for thrust combined with moment.

(6 x 6 = 36)

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