KUMARAGURU
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M.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Second Semester

STRUCTURAL ENGINEERING

P15SET202**:** Design of Substructures

(IS codes: 1904,2911,2950,6403,8009,2131,4091,456, SP-16 are permitted)

COURSE OUTCOMES

CO1: **Assess the nature of soil condition and suggest suitable foundation**

CO2: **Design deep foundations like pile and well foundations.**

CO3: **Design foundation for miscellaneous structures**

CO4: **Design machine foundations.**

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1.   Assertion (A): When water table is located at base of footing then bearing capacity of   CO1   [K$_1$]
        soil reduces.

        Reason (R): Bearing capacity of soil is reduced by 10 %

        a)   Both A and R are Individually true and   b)   Both A and R are Individually true but
                R is the correct explanation of A   R is not the correct explanation of A

        c)   A is true but R is false   d)   A is false but R is true

2.   Minimum and Maximum diameter of pile ranges from   CO1   [K$_1$]

        a)   230mm to 1500mm   b)   230mm to 2000mm

        c)   300mm to 1500mm   d)   300mm to 2000mm

3.   The depth of well foundation below the local scour lever is called as_____.   CO2   [K$_1$]

        a)   Top plug   b)   Curb

        c)   Steining   d)   Grip length

4. Match List I with List II   CO2   [K_1]

List I	List II
A. Increase bearing capacity of sandy soil	i. End bearing pile
B. Load transfer at pile tip	ii. Batter pile
C. Load transfer through surface area	iii. Compaction pile
D. To resist horizontal and inclined forces	iv. Skin friction pile

	A	B	C	D
a)	iii	i	ii	iv
b)	iii	ii	i	iv
c)	iii	iv	ii	i
d)	i	iii	iv	Ii

5. Assertion (A): In block foundation, we analyze considering the mode of uncoupled   CO3   [K_1] vertical motion.

   Reason (R): It is so because we rarely analyze the coupled vertical motion

   a) Both A and R are Individually true and R   b) Both A and R are Individually true but
   is the correct explanation of A   R is not the correct explanation of A

   c) A is true but R is false   d) A is false but R is true

6. IS code for practice of design and construction of well foundation is   CO2   [K_1]

   a) IS 1343(part1):2002   b) IS 3955:1967

   c) IS 8009(part1):1976   d) IS 456:2000

7. Consider the following statement: CO3   [K_1]

   Black cotton soil is unsuitable for foundation because

   1) Bearing capacity is low

   2) Permeability is uncertain

   3) Particles are cohesive

   4) Property to undergo a volumetric change due to variation of moisture content.

   a) 1,3   b) 1,4

   c) 1,2   d) 4 only

8. In under-reamed pile the diameter of the bulb is _____times the dia of pile. CO3 [K$_1$]

    a) 2 to 3 times   b) 2.5 to 3.5 times

    c) 1.5 to 2 times   d) 3 to 4 times

9. The amplitude of motion of the foundation should not exceed CO4 [K$_1$]

    a) 0.2mm   b) 2.5mm

    c) 2mm   d) 3mm

10. Stability analysis for design of chimney foundation CO3 [K$_1$]

    1.Check for bearing capacity

    2.Check for uplift resistance

    3.Check for side trust

    4.Check for overturning & sliding

    a) 2-3-4-1   b) 1-3-2-4

    c) 3-4-2-1   d) 1-2-3-4

PART B (10 x 2 = 20 Marks)

11. Discuss various types of loads that are to be considered in the design of foundation. CO1 [K$_2$]

12. To obtain higher bearing capacity, either width of the footing could be increased or the depth of the footing can be increased. Justify your comments CO1 [K$_2$]

13. List the advantages & disadvantages of pile foundation. CO2 [K$_2$]

14. What is negative skin friction? What is its effect on the pile? CO2 [K$_2$]

15. List out the forces acting on well foundation. CO2 [K$_2$]

16. List the types of Caissons. CO2 [K$_2$]

17. List the various types of foundation used for transmission line tower. CO3 [K$_2$]

18. List the types of anchors used for foundation excavations. CO3 [K$_2$]

19. Define damping parameter. CO4 [K$_2$]

20. List the different types of machine foundation. CO4 [K$_2$]

PART C (10 x 5 = 50 Marks)

21. A strip footing 2m wide carries a load intensity of 400kN/m on sand at a depth of 1.2m. CO1 [K$_4$]
Saturated unit weight of sand is 19.5 kN/m^3 and unit weight of sand above water table is 16.8 kN/m^3. The shear strength parameter is 35°. Determine F.O.S with respect to shear failure for the following cases of location of water table.

    a) water table at ground level

    b) water table at 1.2 m.

22.	Classify and Explain the types of foundation with their applications.	CO1	[K$_4$]
23.	A group of 16 piles 600mm dia is arranged in a square pattern with c/c spacing of 1.2m. The piles are 10m long and are embedded in soft clay with cohesion of 30kN/m^2. Bearing resistance may be neglected for the piles. Adhesion factor = 0.6. Determine the ultimate load carrying capacity of the pile group.	CO2	[K$_4$]
24.	Explain the classification of piles in detail.	CO2	[K$_4$]
25.	Determine the cross-sectional dimensions of a cylindrical open caisson to be sunk through 33m of sand and water to bed rock if the allowable bearing pressure is 1800kN/m^2. The caisson has to support a load of 55MN from the superstructure. Test feasibility sinking if the skin friction is 30kN/m^2. Also calculate the necessary thickness of the seal.	CO2	[K$_4$]
26.	Explain the components of Pneumatic caisson.	CO2	[K$_2$]
27.	List the advantages of under-reamed piles.	CO3	[K$_4$]
28.	Explain the dynamic properties of soil.	CO3	[K$_2$]
29.	Describe the general criteria for machine foundation.	CO4	[K$_4$]
30.	Explain the various types of machine foundation with neat sketches.	CO4	[K$_2$]

Answer any TWO Questions
PART D (2 x 10 = 20 Marks)

31.	Design an isolated footing for an R.C. column of size 300 mm x 300 mm which carries a vertical load of 800 kN together with an uniaxial moment of 40 kN-m. The safe bearing capacity of soil is 250 kN/m^2. Use M25 concrete and Fe 415 steel.	CO1	[K$_4$]
32.	Explain the design procedure for Well foundation.	CO2	[K$_3$]
33.	Explain the necessary information required for the design and construction of transmission line tower foundations and list the forces considered in design.	CO3	[K$_3$]

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