13 CHAPTER

Foundation

Q.1 Minimum clear cover (in mm) to main steel bars in slab, beam, column and footing respectively are
(a) 110, 15, 20, 25 (b) 15, 25, 40, 40
(c) 20, 25, 40, 50 (d) 20, 35, 40, 75

Q.2 Design of foundation for a large generator is guided, primarily by
(a) frequency (b) deformation
(c) strength (d) stiffness

Q.3 How is the depth of footing for an isolated column is governed?
1. By maximum bending moment
2. By shear force
3. By punching shear
Select the correct answer using the codes given below
(a) 2 and 3 only (b) 1 and 2 only
(c) 1 and 3 only (d) 1, 2 and 3

Q.4 An RC square footing of side length 2 m and uniform effective depth 200 mm is provided for a 300 mm × 300 mm column. The line of action of the vertical compression load passes through the centroid of footing as well as of the column. If the magnitude of load is 320 kN, the nominal transverse shear stress in the footing is
(a) 0.26 N/mm^2 (b) 0.30 N/mm^2
(c) 0.34 N/mm^2 (d) 0.75 N/mm^2

Q.5 While designing combined footing, the resultant of the column load passes through the centre of gravity of the footing slab such that the net soil pressure obtained is
(a) parabolic (b) trapezoidal
(c) uniform (d) non-uniform

Q.6 A trapezoidal combined footing for two axially loaded columns is provided when
1. Width of the footing near the heavier column is restricted.
2. Length of the footing is restricted.
3. Projections of the footing beyond the heavier columns are restricted.
Select the correct answer using the codes given below:
(a) 1 and 2 (b) 1 and 3
(c) 2 and 3 (d) 1, 2 and 3

Q.7 The rise and tread of staircase are 150 mm and 250 mm and weight of slab on slope is 5 kN/m^2. The dead weight of horizontal area is
(a) 5.4 kN/m^2 (b) 5.0 kN/m^2
(c) 5.83 kN/m^2 (d) 6.8 kN/m^2

Q.8 A concrete column carries an axial load of 450 kN and a bending moment of 60 kNm at its base. An isolated footing of size 2 m by 3 m, with 3 m side along the plane of the bending moment, is provided under the column, centres of gravity of column and footing coincide. The net maximum and the minimum pressures in kN/m^2 on soil under the footing are respectively
(a) 95 and 55 (b) 95 and 75
(c) 75 and 55 (d) 75 and 75

Q.9 A column, 300 mm × 300 mm is provided on footing 1 m × 1 m supported on soil having allowable bearing pressure of 360 kN/m^2 at depth 1 m below ground. The minimum thickness of footing assuming M20 concrete and Fe415 steel;
(a) 430 mm (b) 490 mm
(c) 530 mm (d) 590 mm

Q.10 For maximum bending moment in the footing under masonary wall, the critical section is located at:
(a) the face of the wall
(b) the middle of the wall
(c) a distance equal to the effective depth of footing from face of wall
(d) midway between the face and the middle of the wall

Answers Foundation

1. (c) 2. (a) 3. (c) 4. (a) 5. (c) 6. (d) 7. (c) 8. (a) 9. (c) 10. (d)

Explanations Foundation

3. (c)
As per clause 34.2 of IS : 456 : 2000

4. (a)
Uniform soil pressure on footing

$$= \frac{320}{2^2} = 80 \text{ kN/m}^2$$

Now section for one way shear is at a distance 'd' from the force of the column

$$\therefore \quad \tau_v = \frac{80 \times 1000 \times \left[\left(\frac{2000-300}{2}\right) - 200\right]}{10^6 \times 1000 \times 200} \times 1000$$

$$= 0.26 \text{ N/mm}^2$$

7. (c)

$$w_1 = w' \frac{\sqrt{R^2 + T^2}}{T}$$

$$= 5 \times \frac{\sqrt{(150)^2 + (250)^2}}{250}$$

$$= 5.83 \text{ kN/m}^2$$

8. (a)

$$\sigma_{max} = \frac{P}{A} + \frac{M}{Z}$$

$$= \frac{450}{2 \times 3} + \frac{60 \times 6}{2 \times 3^2}$$

$$= 75 + 20 = 95 \text{ kN/m}^2$$

$$\sigma_{min} = \frac{P}{A} - \frac{M}{Z}$$

$$= 75 - 20 = 55 \text{ kN/m}^2$$

9. (c)

$$D_{min} = \left\{\frac{L-b}{2}\right\} \tan\alpha \text{ where}$$

$$\tan\alpha \geq 0.9\sqrt{\frac{100 q_{max}}{f_{ck}} + 1}$$

$$f_{ck} = 360 \text{ kN/m}^2 = 0.360 \text{ N/mm}^2$$

$$\Rightarrow D_{min} \geq \left(\frac{1000-300}{2}\right) \times \left[0.9\sqrt{\frac{1000 \times 0.36}{20} + 1}\right]$$

$$\Rightarrow \quad D_{min} \geq 527 \text{ mm}$$

$$\therefore \quad D_{min} = 530 \text{ mm}$$

10. (d)
The critical section for maximum bending moment is locate at midway between the face and the middle of wall as per IS : 456 : 2000.

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