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BCE-041

DIPLOMA IN CIVIL ENGINEERING
DCLE(G) / DCLEVI

Term-End Examination

June, 2016

00750

BCE-041 : THEORY OF STRUCTURES – II

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. 1 is **compulsory**. Attempt any other **three** questions from the remaining. All questions carry equal marks. Assume suitable data wherever necessary and mention it clearly. Use of calculator is allowed. Use of IS : 456 is **not** permitted.*

1. Choose the most appropriate answer from the given alternatives. $7 \times 2\frac{1}{2} = 17\frac{1}{2}$

   (a) The maximum horizontal distance between parallel main reinforcement bars in a slab shall be :

   (i) three times the effective depth of slab

   (ii) 300 mm

   (iii) greater of (i) and (ii)

   (iv) smaller of (i) and (ii)

(b) Minimum diameter of bars as longitudinal reinforcement in a column shall be

(i) 12 mm

(ii) 10 mm

(iii) 16 mm

(iv) 8 mm

(c) The minimum longitudinal reinforcement in a slab as percentage of the gross area of the section using Fe 415 steel is

(i) 0·25

(ii) 0·15

(iii) 0·12

(iv) 0·10

(d) The diameter of lateral tree in a column is taken as

(i) 6 mm

(ii) $\frac{1}{4}$ of the diameter of the largest longitudinal bar

(iii) greater of (i) and (ii)

(iv) None of these

(e) In limit state method of design of concrete structures for the flexural members, the area of the stress block per unit width of beam is

(i) $0{\cdot}45\, f_{ck}\, x_u$

(ii) $0{\cdot}87\, f_{ck}\, x_u$

(iii) $0{\cdot}36\, f_{ck}\, x_u$

(iv) $0{\cdot}42\, f_{ck}\, x_u$

(f) In limit state method for the design of RCC flexural member, the maximum strain in concrete is assumed as

(i) 0·3%

(ii) 0·25%

(iii) 0·35%

(iv) 0·2%

(g) The maximum tensile reinforcement in a beam shall be provided as percentage of the gross sectional area of the beam. This percentage is

(i) 3

(ii) 2

(iii) 4

(iv) 6

2. Design a simply supported beam of 6 m clear span loaded with a uniformly distributed load of 20 kN/m including its self weight. Assume support width 300 mm, grade of concrete M-20, grade of steel Fe 415 for main tension reinforcement and Fe 250 for shear reinforcement. $17\frac{1}{2}$

3. Design the reinforcement for a column of size 400 mm × 600 mm subjected to an axial load of 2000 kN. The column has unsupported length 3·70 m with both ends effectively held in position, but restrained against rotation at one end only. Assume grade of concrete as M-20 and grade of steel as Fe 415. $17\frac{1}{2}$

4. A rectangular R.C. beam of 250 mm × 500 mm (effective depth) has tensile reinforcement of 3 bars of 16 mm ϕ. Calculate the neutral axis depth, if the permissible stress in steel (σ_{st}) is 230 N/mm^2 and in concrete (σ_{cbc}) is 7 N/mm^2. Also determine safe moment of resistance of this section. $17\frac{1}{2}$

5. Design waist slab of the first flight of a stairs in a residential building. Number of steps in this flight are 10 with tread of 300 mm, riser of 150 mm and width of landing 1·2 m. The slab is carrying an imposed load of 3 kN/m^2 and is supported on walls of thickness 250 mm. Use M-20 grade of concrete and Fe 415 grade of steel. $17\frac{1}{2}$

6. (a) Discuss the steps to design over ground cylindrical tank with flexible base. Draw a typical diagram of reinforcement. 9

(b) Differentiate between one way slab and two way slab. Discuss briefly, steps to design a two way slab supported on four edges with corners free to lift. $8\frac{1}{2}$

7. Design a rectangular footing for a superimposed load of 1200 kN. The safe bearing capacity for soil is 200 kN/m^2. Use M-25 grade of steel. Assume nominal cover of 50 mm and size of column as 600 mm × 400 mm. $17\frac{1}{2}$