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BCE-041

DIPLOMA IN CIVIL ENGINEERING
DCLE(G) / DCLEVI

Term-End Examination

June, 2018

00453

BCE-041 : THEORY OF STRUCTURES – II

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. **1** is **compulsory**. Attempt any **four** more questions from the remaining. All questions carry equal marks. Assume suitable data wherever necessary. Use of scientific calculator is permitted.*

1. Choose the most appropriate answer from the given alternatives in questions (a) to (g) : *7×2=14*

(a) The total depth of a beam is 250 mm. It has a layer of steel (3 bars of 20 mm dia) in the tension zone. If the clear cover is 40 mm, the effective depth will be equal to

(i) 210 mm

(ii) 200 mm

(iii) 190 mm

(iv) 270 mm

(b) The minimum number of bars in a column with rectangular ties is

(i) 3

(ii) 4

(iii) 5

(iv) 6

(c) There will be no bond failure in a beam if the end anchorage is equal to or more than

(i) development length

(ii) stirrup spacing

(iii) 50 mm

(iv) 75 mm

(d) In any case, as per IS : 456 – 2000, the maximum spacing of shear stirrup should ***not*** be more than

(i) 0·75 × diameter

(ii) diameter

(iii) 450 mm

(iv) 300 mm

(e) For the design of retaining walls, the minimum factor of safety against overturning is taken as

(i) 1·25

(ii) 1·4

(iii) 2·5

(iv) 3·0

(f) The longitudinal bars required to control torsion are provided along the _____ of the member.

(i) bottom

(ii) top

(iii) mid

(iv) perimeter

(g) In one way slab, loading is transferred in

(i) short direction

(ii) long direction

(iii) either short or long direction

(iv) both short or long direction

2. Explain the term 'limiting depth of neutral axis' in R.C.C. beam design. Derive its value for a rectangular section using Fe 415 grade steel and M 20 concrete. Explain limiting section, over-reinforced section and under-reinforced section. *14*

3. Design a simply supported R.C.C. slab for a roof of a hall 3 m × 10 m (inside dimension) with 230 mm walls all around. Assume a live load of 4 kN/m^2 and finish 1 kN/m^2. Use M 25 grade concrete and Fe 415 steel. *14*

4. Design an axially loaded tied column 400 mm × 400 mm pinned at both ends with an unsupported length of 3 m for carrying a factored load of 2300 kN. Use M 20 concrete and Fe 415 steel. *14*

5. A longitudinal type of staircase spans a distance of 3·75 m centre to centre of beams. The rise R = 175 mm, going G = 250 mm and tread T = 270 mm. The treads have 15 mm granolithic finish and consist of 15 steps. Assuming M 25 concrete and Fe 415 steel, design the staircase for a live load of 5 kN/m^2. Assume breadth of staircase as 1·5 m. *14*

6. A solid footing has to transfer a dead load of 1000 kN and imposed load of 400 kN from a square column 400 mm × 4000 mm (with 16 mm bars). Assuming f_y = 415 and f_{ck} = 20 N/mm^2, safe bearing capacity to be 200 kN/m^2, design the footing. *14*

7. Design a reinforced concrete slab 6·3 m × 4·5 m simply supported on all four sides. It has to carry a characteristic live load of 10 kN/m^2 in addition to its dead weight. Assume M 25 concrete and Fe 415 steel; also assume mild exposure.

   Take α_x = 0·099 and α_y = 0·051. *14*

8. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Working Stress Method of Design

(b) Doubly Reinforced Section

(c) Development Length

(d) Limit State of Serviceability

(e) Helically Reinforced Short Columns

(f) Retaining Walls

(g) Underground Water Tanks