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BCE-041

DIPLOMA IN CIVIL ENGINEERING
DCLE(G) / DCLEVI

Term-End Examination

00287

December, 2017

BCE-041 : THEORY OF STRUCTURES – II

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. 1 is* ***compulsory****. Attempt any other* ***four*** *questions. All questions carry equal marks. Use of scientific calculator is permitted.*

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

   (a) The partial factor of safety for material strength for reinforcement is

   (i) 1·5

   (ii) 2

   (iii) 1·51

   (iv) 1·15

(b) The final vertical deflection due to all loads of a member should be

(i) $< \frac{l_{ef}}{350}$

(ii) $< \frac{l_{ef}}{250}$

(iii) $> \frac{l_{ef}}{350}$

(iv) $> \frac{l_{ef}}{250}$

(c) Minimum tension reinforcement in beams is

(i) $\frac{0{\cdot}85\ bd}{fy}$

(ii) $\frac{85\ bd}{fy}$

(iii) $\frac{0{\cdot}4\ bd}{fy}$

(iv) 4%

(d) For slabs, the maximum spacing between two parallel main reinforcing bars shall be

(i) $3 \times d$

(ii) $5 \times d$

(iii) 300 mm

(iv) whichever is less of (i) and (iii)

(e) Effective length of a column which is fixed at both ends is taken as

(i) $0{\cdot}85\,l$

(ii) $0{\cdot}80\,l$

(iii) l

(iv) $0{\cdot}65\,l$

(f) The modular ratio is determined by

(i) $m = \dfrac{200}{3\,\sigma_{cbc}}$

(ii) $m = \dfrac{280}{\sigma_{cbc}}$

(iii) $m = \dfrac{280}{3\,\sigma_{cbc}}$

(iv) $m = \dfrac{80}{3\,\sigma_{cbc}}$

where σ_{cbc} = Permissible stress in concrete in bending compression

(g) According to IS : 456, the maximum compressive strain in concrete in bending is equal to

(i) $0{\cdot}0002$

(ii) $0{\cdot}0035$

(iii) $0{\cdot}002 + \dfrac{f_{ck}}{E_c}$

(iv) $\dfrac{0{\cdot}670\,f_{ck}}{E_c}$

2. A simply supported beam of 4·5 m span carries a uniformly distributed load of 30 kN/m inclusive of self-weight. The width of the beam is 230 mm and is reinforced on tension side only. Design the smallest concrete section and area of reinforcement. Use M 20 grade concrete and mild steel reinforcement. Assume partial safety factor for load equal to 1·5. *14*

3. Design longitudinal reinforcement for a circular column of diameter 350 mm with lateral ties for a factored load of 1800 kN and effective length 2·75 m for the M 20 concrete and Fe 415 steel. *14*

4. Design a roof slab over a passage of size 14·0 m × 3·0 m, provided at the entrance of a public building. The beam is supported by a 230 mm wide beam and carries a superimposed load of 3·1 kN/m^2. Use M 20 mix and Fe 415 grade steel. Assume mild environment. *14*

5. Design a two-way slab for a room of size 4 m × 5 m with discontinuous and simply supported edges on all sides with corners prevented from lifting to support a live load of 4 kN/m^2. Use M 20 grade concrete and Fe 415 HYSD bars.
Moment coefficients $\alpha_x = 0{\cdot}076$, $\alpha_y = 0{\cdot}056$. *14*

6. Design an RC footing for a masonry wall 375 mm thick carrying a superimposed load of 200 kN/m. The bearing capacity of soil is 150 kN/m^2;

f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2 and Nominal cover = 50 mm. *14*

7. Design one of the flights of 'waist slab' type stairs of a school building spanning between landing beams to suit the following data : *14*

Number of steps = 12, Tread = 300 mm, Riser = 160 mm, Width of landing beam = 400 mm

Materials : M 20 concrete and Fe 415 steel

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

(a) Limit State of Serviceability

(b) Flanged Reinforced Concrete Section

(c) Development Length

(d) Working Stress Method of Design

(e) Cantilever Type Retaining Wall

(f) Overhead Water Tanks

(g) Types of Footings