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BCE-041

DIPLOMA IN CIVIL ENGINEERING
DCLE(G) / DCLEVI

Term-End Examination

December, 2015

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 minimum longitudinal reinforcement in a column is provided as a percentage of gross-sectional area of the column. This percentage is

(i) 0·8

(ii) 0·6

(iii) 1·0

(iv) None of these

(b) Maximum depth of neural axis ($x_{u, max}$) for an RCC flexural member in Limit State Design method of Fe 415 grade of steel is

(i) 0·53 d

(ii) 0·43 d

(iii) 0·48 d

(iv) 0·46 d

(c) The minimum distance between two parallel reinforcement bars in an RCC member shall be

(i) Diameter of the largest bar

(ii) 5 mm more than nominal maximum size of coarse aggregate

(iii) Smaller of (i) and (ii)

(iv) Greater of (i) and (ii)

(d) Basic values of span to depth (up to span 10 m) to control deflection of an RCC flexural member for a cantilever beam is

(i) 10

(ii) 7

(iii) 20

(iv) 26

(e) Maximum spacing of shear reinforcement for vertical stirrups in a beam shall be

(i) 0·75 × effective depth of beam

(ii) 300 mm

(iii) Smaller of (i) and (ii)

(iv) Greater of (i) and (ii)

(f) In an RCC circular column, the minimum number of longitudinal reinforcement bars shall be

(i) 5

(ii) 7

(iii) 6

(iv) 8

(g) In Limit State Method for the design of an RCC flexural member, the stress – strain relationship of concrete is assumed to be parabolic up to strain

(i) 0·30%

(ii) 0·35%

(iii) 0·25%

(iv) 0·20%

2. An R.C. beam of 5·0 m effective span and section of 300 mm and 550 mm (overall depth) is reinforced with 3 bars of 16 mm ϕ. Check whether the beam is under-reinforced or over-reinforced assuming permissible stress in steel (σ_{st}) is 230 N/mm^2 and in concrete (σ_{cbc}) is 7 N/mm^2. Effective cover is 50 mm. Determine the UDL (inclusive of self-weight) this simply supported beam can support. $17\frac{1}{2}$

3. Design the slab of an office floor having an effective size of 3·0 m × 6·5 m. This slab is supported on 300 mm thick masonry walls on all four sides. This slab has to carry an imposed load of 3 kN/m^2. Assume a suitable floor finish load, concrete of grade M-20 and steel of grade Fe 415. $17\frac{1}{2}$

4. Design a simply supported rectangular beam having a clear span of 5·5 m. The beam has to carry a superimposed load (UDL) of 15 kN/m including its self-weight. Adopt support width of 250 mm and M-20 concrete. Use Fe 415 steel for main tension reinforcement and Fe 250 steel for shear reinforcement. $17\frac{1}{2}$

5. Design a suitable R.C. footing for a square column of size 400 mm × 400 mm. The column is reinforced with 8 bars of 20 mm diameter and carrying a factored axial load of 2100 kN. The safe bearing capacity of soil at the site is 250 kN/m^2. Adopt M-20 grade of concrete and Fe 415 grade of steel. $17\frac{1}{2}$

6. Determine the U.D.L. (inclusive of self-weight) for the 'T' beam section shown in Figure 1. The beam is simply supported on both ends and has an effective span of 7·0 m. Adopt M-20 grade of concrete and Fe 500 grade of steel. $17\frac{1}{2}$

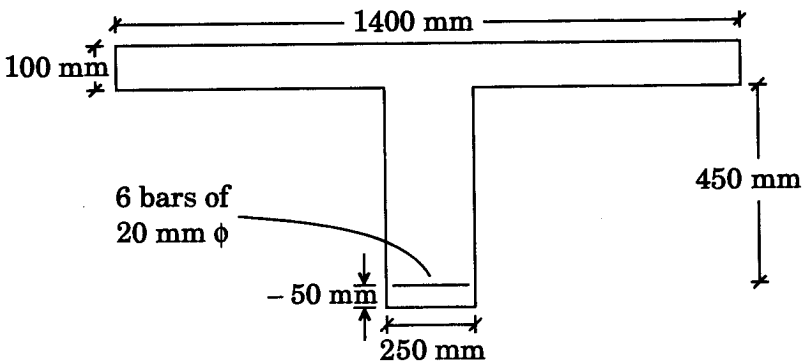

Figure 1

7. (a) Compare Limit State Method and Working Stress Method for the design of R.C. members. 9

(b) Mention the basic assumptions made for the design of reinforced concrete flexural members by Working Stress Method. $8\frac{1}{2}$
