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BCE-041

DIPLOMA IN CIVIL ENGINEERING DCLE(G) / DCLEVI

Term-End Examination

01105

December, 2014

BCE-041 : THEORY OF STRUCTURES – II

Time : 2 hours *Maximum Marks : 70*

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

1. Choose the most appropriate answer from the given alternatives. *7×2=14*

(a) According to IS 456, the maximum compressive stress in concrete for design purpose is taken as

(i) $0{\cdot}370\ f_{ck}$

(ii) $0{\cdot}416\ f_{ck}$

(iii) $0{\cdot}446\ f_{ck}$

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

(b) For a bar in tension, a standard hook has an anchorage value equivalent to a straight length of

(i) 8 ϕ

(ii) 12 ϕ

(iii) 16 ϕ

(iv) 24 ϕ

(c) In limit state design, permissible bond stress in the case of deformed bars is more than that in plain bars by

(i) 60%

(ii) 50%

(iii) 40%

(iv) 25%

(d) A reinforced concrete slab is 75 mm thick. The maximum size of reinforcement bar that can be used is

(i) 12 mm dia.

(ii) 10 mm dia.

(iii) 8 mm dia.

(iv) 6 mm dia.

(e) In a circular column of reinforced concrete, minimum number of longitudinal bars as per IS 456 is

(i) 8

(ii) 4

(iii) 3

(iv) 6

(f) In limit state approach, spacing of main reinforcement primarily controls

(i) collapse

(ii) cracking

(iii) deflection

(iv) durability

(g) The percentage of reinforcement in case of slabs, when high strength deformed bars are used, is not to be less than

(i) 0·15

(ii) 0·12

(iii) 0·20

(iv) 0·30

2. Determine the ultimate moment of resistance of a doubly reinforced section of given data : b = 300 mm, d = 655 mm, d′ = 45 mm, f_y = 415 MPa and f_{ck} = 20 MPa. Assume M 20 concrete and Fe 415 steel. All notations have their usual meanings. *14*

3. Design a one-way slab, with a clear span of 4·0 m, simply supported on 230 mm thick masonry walls, and subjected to a live load of 4 kN/m^2 and a surface finish of 1 kN/m^2. Use M 25 concrete and Fe 415 steel. Assume that the slab is subjected to moderate exposure conditions. *14*

4. Design the torsional reinforcement in a rectangular beam section 350 mm wide and 750 mm deep, subjected to an ultimate twisting moment of 140 kNm. Combined with an ultimate bending moment of 200 kNm and an ultimate shear force of 110 kN. Assume M 25 concrete, Fe 415 steel and mild exposure conditions. *14*

5. (a) Draw a neat sketch showing reinforcement detailing in a cross-section in a span of a typical staircase. *7*

(b) What is the importance of compaction effort provided to concrete at the time of casting ? Describe the working of an equipment used in this respect. *7*

6. Design the longitudinal reinforcement in a column of 400 mm dia. subjected to a factored load of 1,500 kN. The column has an unsupported length of 3·4 m and is braced against sidesway. Use M 25 concrete and Fe 415 steel. *14*

7. Design a reinforced concrete footing for a 230 mm thick masonry wall which supports a load (inclusive of self weight) of 200 kN/m under service loads. Assume a safe soil bearing capacity of 150 kN/m^2 at a depth of 1 m below ground. Assume M 20 grade concrete and Fe 415 grade steel. *14*

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

(a) Quality of concrete

(b) Retaining wall

(c) Ways of curing of concrete

(d) Transverse reinforcement in a concrete column

(e) Working stress design philosophy