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BCE-041

DIPLOMA IN CIVIL ENGINEERING
DCLE(G) / DCLEVI

Term-End Examination

June, 2015

00823

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 flexural strength of concrete is

(i) directly proportional to compressive strength

(ii) inversely proportional to compressive strength

(iii) directly proportional to square root of compressive strength

(iv) inversely proportional to square root of compressive strength

(b) The ratio of the diameter of reinforcing bars and the slab thickness is

(i) 1/4

(ii) 1/5

(iii) 1/6

(iv) 1/8

(c) The modular ratio 'm' in terms of permissible compressive stress due to bending in concrete σ_{cbc} (in N/mm^2) is given by

(i) $\frac{280}{\sigma_{cbc}}$

(ii) $\frac{2800}{\sigma_{cbc}}$

(iii) $\frac{280}{3\,\sigma_{cbc}}$

(iv) $\frac{2800}{3\,\sigma_{cbc}}$

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

(i) 10%

(ii) 20%

(iii) 30%

(iv) 40%

(e) Maximum percentage of reinforcement in case of slabs is limited to

(i) 2

(ii) 4

(iii) 6

(iv) 8

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

(i) $8\,\phi$

(ii) $12\,\phi$

(iii) $16\,\phi$

(iv) $24\,\phi$

where ϕ is diameter of hook.

(g) The effective span of a deep beam is taken as

(i) centre to centre distance between supports

(ii) 1·15 times the clear span

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

(iv) Larger of (i) and (ii)

2. Determine the ultimate moment of resistance for the T-section of the following data : *14*

b_f = 850 mm, D_f = 100 mm, b_w = 250 mm, d = 520 mm, A_{st} = 3695 mm^2, f_y = 250 MPa and f_{ck} = 20 MPa.

3. 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 and Fe 415 steel. *14*

4. Design an RC slab simply supported on all four edges of effective spans 4 × 7 m. Imposed load may be taken as 1·5 kN/m^2. Assume M 20 concrete and Fe 415 steel and nominal cover as 20 mm. *14*

5. (a) Discuss the necessity of using compression reinforcement in a reinforced concrete beam. *7*

   (b) What is the role of ties provided in a reinforced concrete column ? *7*

6. Design longitudinal reinforcement of a circular column of diameter 350 mm with lateral ties for a factored load of 1600 kN and effective length 2·75 m. Take M 20 concrete and Fe 415 steel. *14*

7. Design an isolated footing for a square column 450 × 450 mm, reinforced with 8 – 25 ϕ bars, and carrying a service load of 2300 kN. Assume soil with a safe bearing capacity of 300 kN/m^2 at a depth of 1·5 m below ground. Assume M 20 concrete and Fe 415 steel for the column. *14*

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

(a) Need of curing of concrete members

(b) Quality of concrete

(c) Types of steel reinforcement

(d) T-beam

(e) Importance of water cement ratio