Reg. No. : | | | | | | | | | | |

Question Paper Code : 11216

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2011

Fifth Semester

Civil Engineering

CE 2306 — DESIGN OF RC ELEMENTS

(Regulation 2008)

Time : Three hours **Maximum : 100 marks**

Use of IS 456–2000 is permitted

Answer ALL questions

PART A — (10 × 2 = 20 marks)

1. **Define characteristic load and characteristic strength.**

2. **Define Modulus of rupture.**

3. **Explain compatibility torsion.**

4. **Calculate the development length of 10 mm diameter bars in M25 concrete if the steel is**

   **(a) Mild steel with σ_s = 230 N/mm², **

   (b) Tor steel with σ_s = 415 N/mm².

5. **Why should we provide minimum reinforcements in R.C.C beams?**

6. **Write down the effective width formula, when a single concentrated load acts over the slab.**

7. **Differentiate one way and two way slab.**

8. **Give some examples for structural elements, which will be subjected to torsional moment.**

9. **State any two advantageous of grid floors.**

10. **Define bond.**

PART B — (5 × 16 = 80 marks)

11. (a) **A simply supported beam with clear span 6000 mm, b = 400 mm, d = 560 mm, carries a limit state load of 175 Kn/m (including self wt, dead load and live load). It is reinforced with 4 bars of 28 mm dia, tension steel (A_{st} = 2464 mm²) which continue right into the support. Take $f_{ck} = 20$ N/mm², $f_y = 250$ N/mm². Design shear reinforcement.**

Or

(b) **A rectangular section with b = 200 mm and D = 350 mm is subjected to limit state shear of 80 kN and BM of 25 kN.m. Design the torsional reinforcement for torsion moment of 6 kN.m. Given f_{ck} = 20 N/mm², f_y = 250 N/mm².**

12. (a) **Explain briefly the procedure for the design of shear reinforcement.**

Or

(b) **A reinforced concrete beam reinforced with 4 Nos-12 mm diameter bars has a width of 100 mm and effective depth of 200 mm. The maximum shear force applied is 30 kN. Find the local bond stress and the development length of the tension bars. The permissible stress in concrete is 10 MPa. And that in steel is 140 MPa.**

13. (a) **Determine the cross section and the reinforcement for an axially loaded column with the following data :**

Factored load = 3000 kN

Concrete grade =M20.

Characteristic strength of reinforcement =415 N/mm².

Un supported length of the column = 3 m.

Or

(b) **Design the plinth beam for the following data :**

Length of the wall = 3.8 m: Ht. of wall = 3 m; Thickness of wall = 230 mm

$\gamma_m = 18\ kN/m^3$; $f_{ck} = 20\text{N/mm}^2$, $f_y = 250\text{N/mm}^2$.

14. (a) **Explain**

(i) **Shrinkage deflection.** **(4)**

(ii) **Long term deflection.** **(4)**

(iii) **Equilibrium method of yield line theory.** **(4)**

(iv) **Differentiate between flexural bond stress and anchorage bond stress.** **(4)**

Or

(b) **(i)** **What do you understand by Anchorage length?** **(4)**

(ii) **Discuss whether development length will be different for bars in tension and compression If yes, elaborate.** **(6)**

(iii) **Sketch the standard hooks for various bend angles.** **(6)**

15. (a) **(i)** **Write down the different types of footings and their suitability.** **(8)**

(ii) **Enumerate the procedure for the design of combined rectangular footing for two columns only.** **(8)**

Or

(b) **Design an isolated footing for a square column, 450 mm × 450 mm, reinforced with 8-25 dia bars, and carrying a service load of 2300 kN. Assume soil with a safe bearing capacity (gross) of 300 kN/m² at a depth of 1.5 m below ground. Assume M20 grade concrete and Fe415 grade steel for the footing, and M25 grade concrete and Fe415 grade steel for the column.**

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