Total No. of printed pages = 6

CT-504/DoRCS/5th Sem/2018/M

DESIGN OF RCC STRUCTURE

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

PART – A

Marks – 25

1. Choose the correct answer : 1×6=6

   (a) As per IS 456:2000, the pH value of water should not be

   (i) Less than 6

   (ii) Equal to 6

   (iii) Not less than 6

   (iv) Equal to 7

[Turn over

(b) The neutral axis of a T beam exists in

(i) Within the flange

(ii) At the bottom edge of the slab

(iii) Below the slab

(iv) All the above.

(c) The Young's modulus of elasticity of steel is

(i) 150 kN/mm^2 (ii) 200 kN/mm^2

(iii) 250 kN/mm^2 (iv) 275 kN/mm^2

(d) Spacing of stirrups in a rectangular beam, is

(i) kept constant throughout the length

(ii) decreased towards the centre of the beam

(iii) increased at the ends

(iv) increased at the centre of the beam.

(e) Hanger bars do not qualify as compression reinforcement in doubly reinforced beams, when its area is less than or equal to

(i) 1% (ii) 2%

(iii) 0.2% (iv) 0.5%

(f) Resistance to compression, measured in terms of the aggregate crushing value is

(i) Hardness (ii) Toughness

(iii) Strength (iv) Soundness

2. Fill up the blanks : 1×6=6

(a) As per IS 456:2000, the compressive strength of concrete in structural design is limited to ———.

(b) The formula to calculate development length (Ld) as per IS code is ———.

(c) As per IS 456:2000, modular ratio is determined by the formula ———.

(d) The design strength of materials is obtained by dividing the characteristics strength by ———.

(e) The distance from the centre of the bar to the extreme bottom fibre of a beam section is known as ———.

(f) An RCC column is treated as short column if its slenderness ratio is less than ———.

3. Write true or false : $1 \times 5 = 5$

(a) If the neutral axis depth is greater than the balanced neutral axis depth then the beam section is said to be under reinforced section.

(b) The steel generally used in RCC work is stainless steel.

(c) A T-beam behaves as a rectangular beam of a width equal to its flange if its neutral axis remains below the slab.

(d) A column is regarded as long column if the ratio of its effective length and lateral dimensions exceeds 15.

(e) Reinforced Cement Concrete (RCC) is a composite material.

4. Answer the following questions in brief : $1 \times 8 = 8$

(a) What is soundness of concrete ?

(b) What do you mean by segregation ?

(c) Define toughness of a concrete.

(d) What is T-beam ?

(e) What do you mean by doubly reinforced beam section ?

(f) What is neutral axis depth ?

(g) What is singly reinforced beam section ?

(h) Define effective depth of a beam section.

PART – B

Marks – 45

Answer any *five* questions.

5. Define modular ratio in a reinforced concrete. How does the creep of concrete affect the modular ratio ? A reinforced concrete beam section of size 250 mm × 500 mm effective depth is reinforced with 4 numbers of 20 mm diameter bars. Assuming M20 grade concrete and Fe 415 steel, determine allowable moment of resistance. 2+7=9

6. A beam section of size 250 mm × 500 mm total depth is reinforced as 3-28 Ø as tensile reinforcement and 2-20 Ø as compression reinforcement. Assuming M25 grade concrete and Fe 415 steel, determine allowable and ultimate moment of resistance. 9

7. What do you mean by one way and two way slabs ? What is slenderness ratio of a compression member ? Classify column based on slenderness ratio and define them. Distinguish between unsupported length and effective length. 9

8. Define development length. What is its significance ? Calculate development length if the diameter of bar is 10 mm, for M20 grade concrete and Fe 415 steel. Explain the different types of bond. What are the mechanisms by which bond resistance is mobilised in reinforced concrete ? 1+1+2+2+3=9

9. A reinforced concrete beam of size 300 mm × 550 mm effective depth is reinforced with 4 numbers of 25 mm diameter bars. Assuming M20 grade concrete and Fe 415 steel, determine neutral axis depth and ultimate moment of resistance. 9

10. A reinforced concrete beam of size 300 mm × 500 mm effective depth is reinforced with 4 number of 20 mm diameter bar as tensile reinforcement. The shear reinforcement consists of 2 legged 8 mm diameter stirrup @ 150 mm c/c spacing. Estimate the shear capacity of the section for M25 grade concrete and Fe 415 steel. 9