Total No. of printed pages = 6

END SEMESTER EXAMINATION–2019

Semester – 5th

Subject Code : CT-504

DESIGN OF RCC STRUCTURE

Full Marks – 70

Time – Three hours

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

PART – A

Marks – 25

Answer *all* the questions.

1. Choose the correct answer : 1×5=5

(a) The moment of resistance of an over-reinforced section is

(i) equal to balanced section

(ii) less than balanced section

(iii) more than balanced section

(iv) less than under-reinforced section

[Turn over

(b) The neutral axis of a T beam exists

(i) within the flange

(ii) at the bottom edge of the slab

(iii) below the slab

(iv) All of the above

(c) 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

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

(i) 0.2% (ii) 1.0%

(iii) 1.2% (iv) 1.5%

(e) The anchorage value of a 90 degree hook is

(i) 12$\varnothing$ (ii) 8$\varnothing$

(iii) 15$\varnothing$ (iv) 16$\varnothing$

2. Fill up the blanks : 1×12=12

(a) In RCC steel reinforcement takes up ____ stresses.

(b) The formula to calculate development length (L_d) as per IS code is ____.

(c) Concrete is graded on the basis of ____.

(d) Working stress method is based upon ____ theory.

(e) The modulus of elasticity of steel is taken as ____ MPa.

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

(g) In under-reinforced section, actual neutral axis is ____ critical neutral axis.

(h) The area of stress block as per IS 456 is ____.

(i) Shear reinforcement, provided in the form of vertical bars is known as ____.

(j) If two-way slab has torsion reinforcement at the corners, it is called as ____.

(k) The ratio of effective length to its least lateral dimension in a long column is ____ than 12.

(l) The maximum strain in concrete at the outermost compression fibre is taken as ____ in bending.

3. Write true or false : 1×8=8

(a) In limit state method tensile strength of the concrete is taken into account.

(b) In the under-reinforced section, ultimate strain in steel reaches earlier than concrete.

(c) Concrete is strong in tension and compression.

(d) Under-reinforced section gives sufficient warning before failure.

(e) Reinforced cement concrete (RCC) beam is a composite material.

(f) Torsion reinforcement is provided in restrained slabs.

(g) Diagonal tension is caused by the shear force.

(h) In limit state method, the stress strain distribution for concrete is taken as linear.

PART – B

Marks – 45

Answer any *five* questions. 9×5=45

4. State the assumptions made in the theory of elastic bending. A reinforced concrete beam section of size 300 mm × 500 mm effective depth is reinforced with 4 numbers of 25 mm diameter

bars. Assuming M20 grade concrete and Fe 415 grade steel, determine (i) allowable moment of resistance and (ii) ultimate moment of resistance. 2+7=9

5. Define doubly reinforced beam section. A beam section of size 250 mm × 500 mm total depth is reinforced as 3–36 ∅ as tensile reinforcement and 3 – 25 ∅ as compression reinforcement. Assuming M20 grade concrete and Fe 415 grade steel, ultimate moment of resistance of the beam section. 9

6. What is column ? Give classification of column. Explain the difference between long column and short column. What is the function of transverse reinforcement in a column ? 1+3+3+2=9

7. Define Development length. What is its significance ? Define one-way and two-way slabs. What are the types of two way slabs ? Explain them. 1½+1½+3+3=9

8. Define shear reinforcement along with figure. A reinforce concrete beam of size 300 mm × 450 mm effective depth is reinforced with 4 numbers of 25 mm diameter bar as tensile reinforcement. The

shear reinforcement consists of 2 legged 8mm diameter stirrup @ 150mm c/c spacing. Estimate the shear capacity of section for M25 grade concrete and Fe 415 grade steel. 3+6=9

9. A simply supported RCC beam over an effective span of 8m carrying an imposed load of 30 kN/m. Design the beam using M20 concrete and Fe 415 grade steel. Show the sketch showing arrangement of reinforcement. 9