Total No. of printed pages = 7

END SEMESTER EXAMINATION – 2021

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

Instruction :

- *All* questions of PART – A and PART – B are compulsory.

PART – A

Marks – 25

1. Choose the correct answers from the following questions :   1×10=10

   (i) If the depth of actual neutral axis is less than critical neutral axis, the section is

   (a) balanced   (b) over reinforced

   (c) under reinforced   (d) transformed

(ii) The modular ratio of concrete is given by the formula

(a) $280/2\,\sigma_{cbc}$
(b) $280/4\,\sigma_{cbc}$

(c) $280/3\,\sigma_{st}$
(d) $280/3\,\sigma_{cbc}$

(iii) Value of factor of safety for steel is
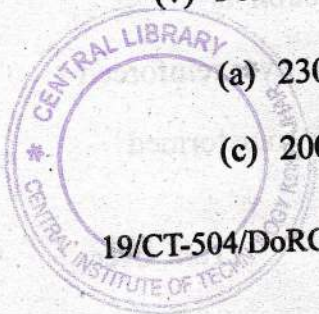
(a) 1.5
(b) 1.15

(c) 1.25
(d) 1.75

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

(a) within the flange

(b) at the bottom edge of the slab

(c) below the slab

(d) All of the above

(v) For Fe 415 steel, permissible stress is

(a) 230 N/mm²
(b) 250N/mm²

(c) 200 N/mm²
(d) 150 N/mm²

19/CT-504/DoRCC Struc.   (2)

(vi) Limiting depth of neutral axis corresponds to

    (a) Balanced section

    (b) Under-reinforced section

    (c) Over reinforced section

    (d) None of the above

(vii) If $l_y/l_x \leq 2.0$, the slab is

    (a) Two way slab   (b) Continuous slab

    (c) Flat slab   (d) One way slab

(viii) According to steel beam theory of doubly reinforced beam

    (a) Tension is resisted by tension steel

    (b) Compression is resisted by compression steel

    (c) Stress in tension steel equals the stress in compression steel

    (d) All of the above

19/CT-504/DoRCC Struc.   (3)   [Turn over

(ix) The anchorage value of a standard U type hook is

    (a) $12 \times$ diameter of a bar

    (b) $14 \times$ diameter of a bar

    (c) $16 \times$ diameter of a bar

    (d) $18 \times$ diameter of a bar

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

    (a) kept constant throughout the length

    (b) decreased towards the centre of the beam

    (c) increased at the ends

    (d) increased at the centre of the beam

2. Answer the following questions : $1 \times 7 = 7$

    (a) What is shear reinforcement ?

    (b) Define doubly reinforced section.

    (c) Write the expression of a neutral axis depth of a T beam when neutral axis is located below the flange.

19/CT-504/DoRCC Struc.   (4)

(d) What is slenderness ratio ?

(e) What do you mean by two-way slabs ?

(f) What is the significance of a development length ?

(g) Define bond of a concrete.

3. Fill up the blanks : 1×8=8

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

(b) Torsion reinforcement should not be provided at the corners which are _____ at both edges.

(c) In order to obtain the best workability of concrete, the preferred shape of aggregate is _____.

(d) The minimum clear cover for R.C.C beam shall be _____.

(e) The design strength of materials is obtained by dividing the characteristics strength by _____.

19/CT-504/DoRCC Struc.   (5)   [Turn over
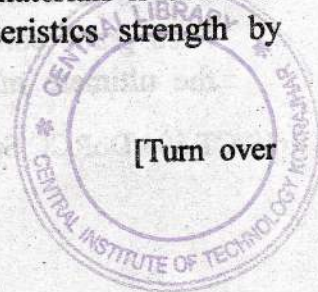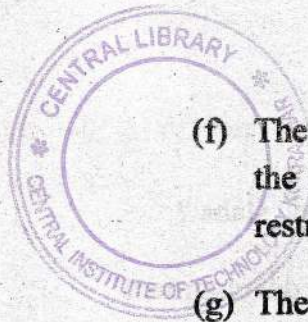
(f) The effective depth of a column when both the ends are effectively held in position but restrained against rotation is _____.

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

(h) The code IS 456:2000 limits the failure strain of concrete to _____.

PART – B

Marks – 45

4. An RCC beam 250 mm × 500 mm effective depth is reinforced with 4 bars of 20 mm diameter. The beam has to carry a superimposed load of 50kN/m including self-weight of the beam, over an effective span of 5 m. Find the allowable and ultimate moment of resistance of the beam section. 9

5. Define doubly reinforced beam section. A beam section of size 250 mm× 550 mm total depth is reinforced as 3-25 Ø as tensile reinforcement and 3-16 Ø as compression reinforcement. Assuming M25 grade concrete and Fe 415 steel, determine the ultimate moment of resistance. 9

19/CT-504/DoRCC Struc. (6)

6. Define Bond. Explain the different types of bond. What are the mechanisms by which bond resistance is mobilised in reinforced concrete? What do you understand by unsupported length and effective length? Explain in brief with diagrams, one-way and two-way slabs?

5+4=9

7. Differentiate working stress method and limit state method? Determine the reinforcement of a balanced reinforced concrete beam section if its effective depth is 2.5 times the width and has to resist an external bending moment of 120 kNm. Assume M20 grade concrete and Fe 415 steel.

3+6=9

8. Define shear reinforcement with figure. A reinforce concrete beam of size 250 mm × 550 mm effective depth is reinforced with 4 numbers of 25 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.

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