Reg. No. :

Question Paper Code: 55013

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fifth Semester

Civil Engineering

15UCE503 - DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Design of RCC cantilever beams is based on the resultant force at

    (a) fixed end   (b) free end
    (c) mid span   (d) mid span and fixed support

2. The maximum shear stress in a rectangular beam is

    (a) 1.25 times the average   (b) 1.5 times the average
    (c) 1.75 times the average   (d) 2 times the average

3. The minimum number of main steel bars provided in RCC

    (a) rectangular column is 4   (b) circular column is 6
    (c) octagonal column is 8   (d) all the above

4. On an absolutely rigid foundation base, the pressure will be

    (a) more at the edge of the foundation (b) uniform
    (c) Not uniform   (d) Zero at the centre of footing

5. A very comfortable type of stairs is

    (a) Straight   (b) Dog legged   (c) Geometrical   (d) open newel

PART - B (5 x 3 = 15 Marks)

6. With neat sketches explain the load distribution mechanism in two way slabs.

7. What is "equivalent shear" as applied to torsion and shear?

8. What are the specifications for spiral reinforcements in columns?

9. Differentiate punching shear and bending shear.

10. Illustrate, with the help of diagrams, the stairs spanning transversely.

PART - C (5 x 16 = 80 Marks)

11. (a) Design a simply supported RCC slab for a roof of a hall 3m x 8m with 230mm walls all around. Assume live load of $3.5kN/m^2$. Use M20 grade concrete and Fe415 steel.

(16)

Or

(b) Determine the reinforcement required for a beam of width = 300mm, overall depth = 650mm. Factored moment = 400kNm. Use M15 grade concrete and Fe415 steel.

(16)

12. (a) A T beam and slab system of a structure are made of beams spaced at 2.5m with clear span of 6.8m between masonry walls of 230mm thick. D_f = 140mm, b_w = 350mm, D= 600mm Design the shear steel. Assume that 2 Numbers of 20mm bars of tension steel are continued to support. Assume live load = 6.5 kN/m^2. (16)

Or

(b) A beam with four 28mm bars as main tension steel has two of its four main bars symmetrically bent at the ends of the beam at 45 degrees. Find the stirrups required for resistance against shear failure at the ends. Factored shear force at the critical section is 550kN. Assume b = 300mm, D = 600mm. Use M25grade concrete and Fe250 steel. (16)

13. (a) Design a circular pin ended column 400mm diameter and helically reinforced with an unsupported length of 4.2m to carry a factored load of 1200kN. Use M25grade concrete and Fe415 steel. (16)

Or

(b) Design the longitudinal steel required for a column 350mm x 550mm carrying P_u = 2000kN The factored moment about major and minor axis is 150kNm and 100kNm respectively. Assume f_{ck} = 15N/mm^2 and f_y =415 N/mm^2. (16)

14. (a) (i) Illustrate, the standard method of detailing the RCC footing as per IS standards.

(8)

(ii) Discuss about the various types of footings. (8)

Or

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(b) Design a footing for a 500 x 350mm column using 20mm bars as dowels to transmit characteristic loads of 750kN as dead load and 500kN as live load to a foundation with safe bearing capacity of 150 kN/m². Assume $f_{ck} = 20N/mm^2$ and $f_y = 415$ N/mm².

(16)

15. (a) (i) What is meant by dog legged stair case? Sketch a layout of such a stair case and indicate the spans for design. (8)

(ii) Sketch a layout of slab staircase spanning longitudinally and supported on beams at its ends. Detail the typical steel reinforcement if they are simply supported. (8)

Or

(b) A staircase has the following dimensions: Waist = 75mm, Nosing = 25mm, Rise = 175mm, Going = 225mm,. The live load = 3kN/m². Calculate the factored loads and effective depth for design if the stair case is spanning (a) transversely (b) longitudinally. (16)

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