Code No: R31011 **R10** **Set No: 1**

III B.Tech. I Semester Regular Examinations, November/December - 2012

DESING AND DRAWING OF CONCRETE STRUCTURES

(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Note: Answer any ONE question from PART-A and THREE question from PART-B
Use of IS-456-2000 and design charts from SP-16 is allowed.

PART-A

1. A reinforced concrete beam is to be designed over an effective span of 5 m to support a design service live load of 8 kN/m. Adopt M20 grade concrete and Fe415 HYSD bars and design the beam to satisfy the limit states of collapse and serviceability. Sketch the details of reinforcement. [30]

OR

2. A simple supported floor slab 6.5 m × 3.0 m has to carry a half-brick partition wall of reinforced brickwork 3 m in height built along the full 3 meter span at the center of the slab in addition to an imposed characteristic load of 2.5 kN/m^2. Design the floor slab assuming f_y = 415 N/mm^2, and f_{ck} = 20 N/mm^2. Sketch the details of reinforcement. [30]

PART-B

3. A rectangular section of a simply supported beam is 250 × 420 mm in section with effective cover of 40 mm to the center of reinforcement. It has 4 Nos. of 12 mm bars continued to the supports. Find the shear capacity at the support if the shear reinforcement consists of double vertical stirrup of 8 mm diameter at 200 mm spacing. Assume f_y = 250 N/mm^2, and f_{ck} = 20 N/mm^2. [15]

4. Design the reinforcements in a circular reinforced concrete column of diameter 350 mm with helical ties to support a factored axial load of 1600 kN. The column has an unsupported length of 3.5 m and is braced against side sway. Adopt M25 grade concrete and Fe500 grade reinforcement. [15]

5. A square footing 3.5 m × 3.5 m is used for a square column 300 × 300 mm carrying a total ultimate load of 1500 kN. Safe bearing capacity of the soil is 100 kN/m^2. Using grade 20 concrete and Fe415 steel, design the footing as sloped footing. [15]

6. Design a cantilever staircase consisting of independent steps cantilevering out of the wall. The width of steps is 1.0 m with rise and tread of 175 mm and 250 mm, respectively. The staircase is to support a superimposed load of 3.0 kN/m^2. Use M20 grade concrete and HYSD steel of grade Fe415 as reinforcement. [15]

7. (a) Explain with derivation how span/depth ratio can be used to control deflection in beams.
   (b) What are high bond bars? Why is it necessary to specify projections on bars made from FE415 and Fe500 steel, whereas such projections are not obligatory for Fe250 steel?
   (c) Why is the partial safety factor for concrete (γ_c) greater than that for reinforcing steel (γ_s) in the consideration of ultimate limit states? [5 + 5 + 5]

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Code No: R31011 **R10** **Set No: 2**

III B.Tech. I Semester Regular Examinations, November/December - 2012

DESING AND DRAWING OF CONCRETE STRUCTURES

(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Note: Answer any ONE question from PART-A and THREE question from PART-B
Use of IS-456-2000 and design charts from SP-16 is allowed.

PART-A

1. Design a reinforced concrete continuous beam of rectangular section to support a dead load of 8 kN/m and service live load of 15 kN/m over 4 spans of 8 m each. Assume the ends as simply supported. Adopt M20 grade concrete and Fe415 HYSD bars. Sketch the details of reinforcements in the continuous beam. [30]

OR

2. A room is 3.0 m × 4.5 m, and the walls are built with 250 mm brick work. It is covered with a simply supported slab which has to take an imposed characteristic load of 2.0 kN/m^2. Design the slab and sketch the layout of the reinforcements. Explain whether this slab needs any corner steel as reinforcement. Assume f_y = 415 N/mm^2, and f_{ck} = 15 N/mm^2. [30]

PART-B

3. A reinforced concrete simply supported beam is 300 × 500 mm in section. It has an effective span of 6 m and cover to center of the main steel is 50 mm. It is reinforced at the center of the beams with 5 Nos. of 20 mm mild steel bars of which 2 Nos. are curtailed at 0.15L from the supports. Mild steel bars are to be used as shear steel also. If the shear force at the supports due to the uniformly distributed characteristic load is 100 kN, design the shear reinforcement. Assume that grade 25 concrete is used for the beam. [15]

4. Design a short circular column of diameter 350 mm to support a factored axial load of 1000 kN, together with a factored moment of 100 kNm. Adopt M20 grade concrete and Fe415 HYSD bars. [15]

5. Design a pad footing (constant depth) for a rectangular column 300 × 450 mm carrying an axial factored load of 1500 kN. The safe bearing capacity of the soil is 120 kN/m^2. Use M20 concrete and grade 415 steel. [15]

6. Design a flight between landing to landing of a tread-riser type of staircase, with 10 risers, each 150 mm, and with tread of 270 mm. The upper and lower landings are 1200 mm wide each supported on 230 mm thick masonry walls at the edges, parallel to the risers. The risers are liable to be overcrowding. The materials to be used for construction are M20 grade concrete and HYSD bars of grade Fe415. [15]

7. (a) What methods are available in IS code for control of crack width in RC members? Are the methods and formulae for calculation for crack width given in IS code?
(b) Explain the terms average bond stress and local bond stress. Derive expressions for these.
(c) Why is it that the partial safety factor for concrete (γ_c) is applicable at all stress levels whereas that for reinforcing steel (γ_s) is applicable only near the "yield stress" level? [5 + 5 + 5]

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Code No: R31011 **R10** **Set No: 3**

III B.Tech. I Semester Regular Examinations, November/December - 2012

DESING AND DRAWING OF CONCRETE STRUCTURES

(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Note: Answer any ONE question from PART-A and THREE question from PART-B
Use of IS-456-2000 and design charts from SP-16 is allowed.

PART-A

1. Design a rectangular reinforced concrete beam to resist service moments of 120 kNm from dead loads and 110 kNm from live loads. The beam dimensions should be 250 × 625 mm and cover 25 mm with 10 mm stirrups. f_y = 250 N/mm^2, and f_{ck} = 15 N/mm^2. Sketch the details of reinforcement. [30]

OR

2. A framed building (slabs on beams and columns) with columns spaced at 4 m in the North-South direction and columns spaced at 5 m in the East-West direction has RCC slabs over the beams. The slab has to carry a characteristic live load of 3 kN/m^2 in addition to a floor finish of 1 kN/m^2, and the dead load. Using concrete of grade 20 and Fe415 steel design a suitable corner slab. Sketch the details of the main and corner steel reinforcement. [30]

PART-B

3. A beam of rectangular section is reinforced with 6 Nos. 18 mm diameter bars in tension and is supported on an effective span of 5 m, the beam being 300 mm wide and 700 mm depth. The beam carries a uniformly distributed load of 42 kN/m. If σ_{sv} = 230 N/mm^2, τ_c = 0.30 N/mm^2 and f_y = 415 N/mm^2, design the shear reinforcement considering no bars are bent up for shear. At what distance from support can 2 Nos. 18 mm bars be bent up. Obtain web reinforcement with bars bent up. Take j = 0.902. [15]

4. A concrete column 500 × 700 mm is of effective height 6 m and is provided with 6 Nos. of 25 mm bars as longitudinal steel. Determine its ultimate bending moment capacity about the major axis when it will be subjected to an ultimate axial load of 2.5 MN. Assume f_y = 415 N/mm^2, and f_{ck} = 25 N/mm^2, and clear cover according to IS 456 for normal conditions of exposure. Place the steel for maximum moment capacity about major axis. [15]

5. Design a combined footing for the two columns of a multistorey building. The columns of size 400 × 400 mm transmits a working load of 800 kN each and they are spaced at 5 m centers. The safe bearing capacity of soil at the site is 200 kN/m^2. Adopt M20 grade concrete and Fe415 grade reinforcement. [15]

6. Design a single flight straight stairs in a residential building for the movement from the ground at the roof at a height of 3.3 m. The stairs are built in the wall with a bearing of 120 mm along the flight and support a superimposed load of 3.0 kN/m^2. The weight of finishes is 0.30 kN/m^2 of finished step surface. The rise and tread of the step are 175 mm and 250 mm, respectively. The width of the stairs is 1.00 m. The materials of construction are M20 grade concrete and Fe415 grade steel. [15]

7. (a) When will one provide side reinforcement in beams? What are the specifications regarding its position?
(b) If the theoretical steel needed is A_s and if much more steel than necessary has been provided, can the development length for the bars be of reduced value than the theoretical? Justify your answer.
(c) How does the stress strain curve of concrete vary with various types of loading? Sketch a typical stress strain curve of concrete and indicate the various moduli.
[5 + 5 + 5]

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Code No: R31011 **R10** **Set No: 4**

III B.Tech. I Semester Regular Examinations, November/December - 2012

DESING AND DRAWING OF CONCRETE STRUCTURES

(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Note: Answer any ONE question from PART-A and THREE question from PART-B
Use of IS-456-2000 and design charts from SP-16 is allowed.

PART-A

1. An L beam has the flange width of 900 mm, with the thickness of slab 100 mm. The web below is 250 × 500 mm. Determine the areas of steel required for it to carry a limiting moment of 600 kNm. Assume f_{ck} = 15 N/mm^2 and grade 415 steel. Sketch the details of reinforcement. [30]

OR

2. Design a simply supported slab to cover a hall with internal dimensions 4.0 m × 6.0 m. The slab is supported on masonry walls 230 mm thick. Assume a live load of 3 kN/m^2 and finish load of 1 kN/m^2. Use M20 concrete and Fe415 steel. Assume that the slab corners are prevented from lifting up. [30]

PART-B

3. A reinforced concrete beam 500 mm wide and 1060 mm effective depth carries a load of 10 kN/m, inclusive of its own weight on a simply supported span of 10 m. The beam is reinforced with 12 Nos. 20 mm diameter bars in two layers with 8 Nos. at bottom and 4 Nos. above that. Find the distance from the center of beams where bars can be bent up in pair, total Nos. of bars to be curtailed being 6 Nos. Suggest the arrangement of bars and design vertical stirrups for shear as necessary. Assume $\sigma_{sv} = \sigma_{st}$ = 230 N/mm^2, τ_c = 0.32 N/mm^2, τ_{bd} = 0.60 N/mm^2 and f_y = 415 N/mm^2. [15]

4. A short column 250 square has to carry an ultimate axial load of 600 kN along with ultimate moments of 60 kNm about one axis and 40 kNm about the other axis. Assuming f_y = 415 N/mm^2, and f_{ck} = 30 N/mm^2 and cover to be the minimum as per IS 456; design the longitudinal steel. [15]

5. Design a trapezoidal footing for the two columns A and B transmitting service loads of 800 kN and 1600 kN respectively. The column A is 400 mm square and column B is 600 mm square in size and they are spaced at 5 m centers. The property line is 300 mm beyond the face of column A. The safe bearing capacity of soil at site is 150 kN/m^2. Adopt M20 grade concrete and Fe415 HYSD bars. [15]

6. A staircase of 1.2 m width for an office building consists of each step built into the wall with a bearing of 110 mm along the flight with the tread = 250 mm and rise = 200 mm. Design the staircase, assuming f_y = 415 N/mm^2, and f_{ck} = 15 N/mm^2. [15]

7. (a) What broad practical rules would you use in choosing a depth for an RCC beam?
(b) Obtain expression for calculation of bond stress and shear stress in case of reinforced concrete beams of rectangular section with tensile steel of diameter □. Also obtain relationship between bond stress and shear stress.
(c) Explain the basis for the selection of partial safety factors (for loads and materials) by IS code for "Serviceability limit states"? [5 + 5 + 5]

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