Code No: RT31013 **R13** SET - 1

III B. Tech I Semester Regular/Supplementary Examinations, October/November- 2016
DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any ONE Question from Part – A and any THREE Questions from Part – B
Use of IS: 456-2000 and design charts from SP-16 is allowed.
For all designs adopt Limit State Method

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PART –A

1 Design a simply supported rectangular beam to carry 30kN/m superimposed load over a span of 6m on 460mm wide supports. Use M20 grade concrete and FE 415 grade steel. Check the design for all necessary conditions. Draw to a suitable scale: [28M]
a) Longitudinal section showing the reinforcement details.
b) The cross section of the beam at salient points, showing reinforcement details

OR

2 Design a continuous RC slab for a hall 6.5m and 13.5m long. The slab is supported on RCC beams each 240mm wide which are monolithic. The ends of the slab are supported on walls. 300mm wide. Design the slab for a live load of 2 kN/m^2. Assume the weight of roof finishing equal to 1.5 kN/m^2. Use M15 concrete and Fe 415 steel. [28M]
a) Draw the reinforcement of the slab in plan view
b) Draw cross section of the slab including beams with reinforcement details.

PART -B

3 a) Define the term 'Partial safety factors' as used in limit state design. Identify the various factors and state the values recommended in IS 456 [7M]
b) Compare 'Working stress method' and limit state design of RCC structures. Explain the answer with suitable examples. [7M]

4 The T beam floor consists of 12cm thick R.C. slab monolithic with 30cm wide beams. The beams are spaced at 3.5m center to center and their effective span is 8m. If the superimposed on the slab is 6.5kN/m^2, design an intermediate beam and an end beam. Use M20 mix and TMT 415 grade steel. [14M]

5 Design a slender circular column of 35cm diameter with the following data. Unsupported length = 8m. Effective length = 5m. Axial load = 500kN. Moment at top = 60kNm. Moment at bottom = 40 kNm. The column bends in double curvature [14M]

6 Design a square spread footing to carry a column of 1200kN from a 40 cm square tied column containing 20m bars as the longitudinal reinforcement. The bearing capacity of soil is 150 kN/m^2. Consider base of footing as 1m below the ground level. The unit weight of earth is 20 kN/m^3. Use σ_y = 415 N/mm^2 and σ_{ck} = 20 N/mm^2 [14M]

7 The section of a cantilever beam designed for a span of 4.0m is having dimensions 300 x 600mm with 3 numbers 28mm diameter bars in compression and 3 numbers 20mm diameter bars in tension. The beam has been designed for a bending moment of 180kNm (at support) under service loads, of which 60 percent is due to permanent (dead) loads. The loading is uniformly distributed on the span. Assume M20 concrete and Fe 415 steel [14M]

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Code No: RT31013 **R13** SET - 2

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(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any ONE Question from Part – A and any THREE Questions from Part – B
Use of IS: 456-2000 and design charts from SP-16 is allowed.
For all designs adopt Limit State Method

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PART –A

1 A T beam floor consists of 12cm thick R.C. slab monolithic with 30cm wide beams. The beams are spaced at 4.0m center to center and their effective span is 7.5m. If the superimposed on the slab is 7.0 kN/m^2, design an intermediate slab. Use M20 mix and TMT 415 grade steel .draw to scale ; [28M]

a) Longitudinal section showing the reinforcement details
b) The cross section of the beam at salient points, showing reinforcement details

OR

2 Design an isolated square footing for a column 450mm x 450mm reinforced with 8-25mm diameter bars carrying a service load of 2000 kN The bearing capacity of soil is 250 kN/m^2 at a depth of 1.5m below ground. The footing is restricted to 2.0m in one direction Assume M20 grade concrete and Fe 415 grade steel for the footing and M25 concrete and Fe 415 steel for the column. Draw to scale: [28M]

a) Longitudinal section showing the reinforcement details.
b) The plan showing reinforcement details.

PART -B

3 A rectangular beam section is 20cm wide and 40 cm deep up to the center of tension steel, which consist of 4-20 mm TOR bars. Find the position of the neutral axis, the lever arm, forces of compression and tension, cracking moment and safe moment of resistance of concrete is of M20 mix and steel is of Fe500 grade [14M]

4 The flange of a T beam flange of the beam is 90 cm x 10cm and web below is 30cm x 40cm. It is reinforced with 4-20 mm plus 4-12mm Fe 415 steel bars in tension at an effective cover of 60mm. Determine the shear reinforcement needed for a shear force of 200kN (i) If the mix is M20 and (ii) if the mix is M30. Take load factor = 1.2. [14M]

5 a) What is meant by slenderness ratio of a compression member and what are its implications. Distinguish between short and long column. [7M]

b) A short column 40cm square in cross section is reinforced with 4-20 mm bars longitudinally which are bound together with lateral ties. Determine safe axial load on the column [7M]

6 Design a two-way slab simply supported on all the four edges for a room 6m x 3.5m clear in size. The superimposed working load is 3.5 kN/m^2 for (**i**) corners held down and (**ii**) corners not held down. [14M]

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7 A one-way slab has been designed for a simply supported span of 4.0m with an overall depth of 170mm and clear cover of 20mm. using M20 concrete and fe 415 steel. The dead load is taken as 5.0 kN/m2 and live load of 2.0m kN/m^2. The longitudinal bars are designed as 10mm diameter 150mm c/c. verify the adequacy of the thickness provided. [14M]
(a) Applying the limiting span/ effective depth ratio
(b) Actual calculation of total deflections

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Code No: RT31013 **R13** SET - 3

III B. Tech I Semester Regular/Supplementary Examinations, October/November- 2016
DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any ONE Question from Part – A and any THREE Questions from Part – B
Use of IS: 456-2000 and design charts from SP-16 is allowed.
For all designs adopt Limit State Method

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PART –A

1 Design a plain concrete footing for to a rectangular column 30cm x 30cm carrying an axial service load of 330 kN (under service loads due to dead and live loads). The net bearing capacity of soil is 360 kN/m^2 at a depth of 1.0 m below ground level.. Use σ_y = 415 N/mm^2 and σ_{ck} = 20 N/mm^2.Draw to scale : [28M]
   a) Longitudinal section showing the reinforcement details.
   b) The plan showing reinforcement details.

OR

2 Design a simply supported roof slab for a room 4.5 m x 6 m measuring from inside. Thickness of the wall is 400 mm. The superimposed load exclusive of the self weight is 2.5 kN/m^2. The slab may be assumed to be simply supported on all four edges with corners held down. Use M20 mix and Fe 415 grade steel. [28M]
   a) Draw the reinforcement of the slab in plan view
   b) Draw cross section of the slab including beams with reinforcement details.

PART -B

3 Design a rectangular beam for an effective span of 6m.The-superimposed load is 80kN/m and size of the beam is limited to 30cm x 70cm. Use M20 mix and Fe415 grade steel. [14M]

4 An RC beam has an effective depth of 450mm and breadth of 300mm. It contains 5-20mm bars mild steel out of which two bars curtailed at a section where shear force at service load is 100kN. Design the shear reinforcement if the concrete is M20 [14M]

5 Design a section of a ring beam 50cm wide and 65cm deep subjected to a bending moment of 120kNm, twisting moment of 7.5-kNm and shear force of 150 kN at ultimate. Use M20 mix and Fe 415 grade steel [14M]

6 a) Explain clearly the difference in the behavior of one-way slabs and two-way slabs with reinforcement details. [14M]

   b) Explain need for corner reinforcement in two way rectangular slabs whose corners are prevented from lifting up

7 Explain short-term deflection. Explain the difficulty in estimating short term deflection as per IS code procedure when applied moment at service loads is marginally less than the cracking moment Are the nominal detailing requirements of the code adequate for ensuring crack width control? Comment. [14M]

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(Civil Engineering)

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For all designs adopt Limit State Method

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PART –A

1 Design a simply supported rectangular beam to carry 35kN/m superimposed load over a span of 5m on 330mm wide supports. Use M20 grade concrete and FE 415 grade steel. Check the design for all necessary conditions. Draw to a suitable scale. [28M]
a) Longitudinal section showing the reinforcement details.
b) The cross section of the beam at salient points, showing reinforcement details.

OR

2 Design an isolated square footing for a column 300mm x 300mm reinforced with 8-16mm diameter bars carrying a service load of 1500 kN The bearing capacity of soil is 180 kN/m^2 at a depth of 1.5m below ground. The footing is restricted to 1.8 m in one direction Assume M20 grade concrete and Fe 415 grade steel for the footing and M25 concrete and Fe 415 steel for the column. [28M]

PART -B

3 a) What are the assumptions for the design of a reinforced concrete section for limit state of collapse in bending? [14M]
b) Show that the limiting depth of neutral axis for a rectangular cross section reinforced with FE415 grade steel in 0.48d.

4 An L beam has flange of the beam is 90 cm x 12cm and web below is 23cm x 50cm. Determine the area of compression and tension steels needed for the cross section if it is to carry a factored bending moment of 400 kNm. Assume M20 concrete and TMT 500 grade steel**.** [14M]

5 An RC beam has an effective depth of 300mm and breadth of 150mm. It contains 4-20mm bars. Determine the shear resistance of the concrete beam if σ_{sv} = 415 N/mm^2 for (i) σ_{ck} = 20 N/mm^2 and (ii) σ_{ck} = 30 N/mm^2 [14M]

6 Design a short circular column 6m long to carry an axial load of 250kN if both ends of the column are fully restrained using (**i**) Lateral ties and (**ii**) helical steel. [14M]

7 Design a simply supported roof slab for a room 8m x 3.5m clear in size if the superimposed load is 5kN/m^2. Use M15 mix and Fe 415 grade steel. [14M]

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