Code No: R1631014 **R16** SET - 1

III B. Tech I Semester Regular Examinations, October/November - 2018

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

IS: 456 – 2000 & Column interaction diagrams only from SP-16 are to be Provided to the student in the Examination hall.

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PART –A

1 Design a continuous RC slab for a hall 7m and 14m long. The slab is supported on RCC beams each 300mm wide which are monolithic. The ends of the slab are supported on walls. 300mm wide. Design the slab for a live load of 3 kN/m^2. Assume the weight of roof finishing equal to 1.0 kN/m^2. Use M20 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.

(OR)

2 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 Use M25 mix and FE 415 grade steel. [28M]

a) Longitudinal section showing the reinforcement details.

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

PART -B

3 A rectangular beam section is 20cm wide and 35 cm deep up to the center of tension steel, which consist of 4-16mm 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 12cm and web below is 30cm x 40cm. It is reinforced with 4-25 mm plus 4-12mm Fe 415 steel bars in tension at an effective cover of 50mm. Determine the shear reinforcement needed for a shear force of 250kN (i) If the mix is M20 and (ii) if the mix is M25. Take load factor = 1.5. [14M]

5 Design a square spread footing to carry a column of 1800kN from a 60 cm square tied column containing 25mm bars as the longitudinal reinforcement. The bearing capacity of soil is 180 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]

6 a) What is the minimum percentage of steel allowed in a RC column. Explain why it is necessary to specify the minimum percentage. [14M]

b) A column 230 mm x 350 mm is reinforced with 4 bars 20mm one at each corner effective cover of 50mm. It is loaded with characteristic load = 340 kN. Factored Moment in the direction of larger dimension Mux = 30 kNm. Factored Moment in the direction of shorter dimension Muy = 18 kNm. About Y axis bisecting the width. Assume concrete grade M 20 and steel grade Fe 415 steel. Check the safety of the column.

7 Write short notes on [14M]

i) Reason to design as a under reinforced section
ii) Diagonal tension
iii) Torsion provisions in beams
iv) Uniaxial and Biaxial bending in columns

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(Civil Engineering)

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Answer any ONE Question from Part – A and any THREE Questions from Part – B

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PART –A

1 The T beam floor consists of 12cm thick R.C. slab monolithic with 30cm wide beams. The beams are spaced at 3.0m center to center and their effective span is 7.5m. If the superimposed on the slab is 6kN/m^2, design an intermediate beam. Use M20 mix and FE 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 a continuous RC slab for a hall 4 m wide and 12 m long supported on floor beams spaced at 3m c/c. Design the slab for a live load of 2.5 kN/m^2. Use M20concrete 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 beam section is 230 mm wide and 400 mm deep is reinforced with tension reinforcement 2000mm^2 at an effective cover of 30 mm. Determine the ultimate moment of resistance of beam section. Use M20 mix and steel is of Fe 415 grade steel. [14M]

4 a) What are the assumptions for the design of a reinforced concrete section for limit state of collapse in bending? [7M]

b) Show that the limiting depth of neutral axis for a rectangular cross section reinforced with FE415 grade steel in 0.48d. [7M]

5 An RC beam has an effective depth of 450mm and breadth of 250mm. It contains 4-25mm bars mild steel out of which two bars are bent up at 30 degrees near the support in tension. Calculate the shear resistance of the bent up bars. What additional stirrups are needed if it has to resist a design shear force of 150 kN. Use M20 mix. [14M]

6 Design an isolated square column 400mm x 400mm reinforced with 6 - 20mm diameter bars carrying a service load of 1400 kN The bearing capacity of soil is 200 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. [14M]

7 The section of a cantilever beam designed for a span of 4.0m is having dimensions 300 x 600mm with 3 numbers 20mm diameter bars in compression and 3 numbers 16mm diameter bars in tension. The beam has been designed for a bending moment of 170kNm (at support) under service loads, of which 65 percent is due to permanent (dead) loads. The loading is uniformly distributed on the span. Assume M20 concrete and Fe 415 steel. [14M]
i) Calculate the maximum short-term deflection
ii) The short-term deflection due to live loads alone.

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Code No: R1631014 **R16** SET - 3

III B. Tech I Semester Regular Examinations, October/November - 2018

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

IS:456 – 2000 & Column interaction diagrams only from SP-16 are to be Provided to the student in the Examination hall.

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PART –A

1 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]

i) Draw the reinforcement of the slab in plan view

ii) Draw cross section of the slab including beams with reinforcement details.

(OR)

2 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. 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

PART -B

3 Design a balanced singly reinforced concrete beam with a span of 5m to carry a dead load of 25-kN/m and working live load of 20 kN/m. Use M20 mix and steel is of Fe 415 grade steel. [14M]

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 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]

6 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]

7 The section of a cantilever beam designed for a span of 5.0m 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 200kNm (at support) under service loads, of which 70 percent is due to permanent (dead) loads. The loading is uniformly distributed on the span. Assume M20 concrete and Fe 415 steel. Calculate the maximum short-term deflection. [14M]

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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

IS:456 – 2000 & Column interaction diagrams only from SP-16 are to be Provided to the student in the Examination hall.

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PART –A

1 Design an isolated square footing for a column 450mm x 450mm reinforced with 8-25 mm 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 2.0 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]

Draw to scale:

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 balanced singly reinforced concrete beam with a span of 6m to carry a dead load of 30-kN/m and working live load of 25 kN/m. Use M15 mix and steel is of Fe 415 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 Draw axial force moment interaction curve for a rectangular column with 2% steel distributed equally on two faces. Assume a minimum of 12 bars placed at an effective cover of 0.15D. [14M]

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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