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

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

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 (28 Marks)

1 Design a T- Beam for the following data: [28M]
Span (ends are simply supported) = 9 m, Spacing of the beams = 3 m,
Superimposed load= 5 kN/m, Thickness of slab= 125 mm,
Weight of walls on the beam = 15 kN/m, Width of web = 250 mm, Total depth = 650 mm.
Use M20 grade of concrete and Fe 500 grade steel.
Design the beam for shear reinforcement also. Check the beam for all necessary conditions. Draw to a suitable scale:
i) longitudinal section showing the reinforcement details,
ii) Cross-section of the beam at salient points, showing the reinforcement details.

(OR)

2 Design a reinforced axially loaded square column to carry a load of 1200 kN including DL, LL and self weight. The column is continuous through beams and slab floors at both the ends. The clear height between the floor and soffit of beam is 6 m. Adopt M20 grade of concrete and Fe 415 grade steel. Draw to a suitable scale: [28M]
i) Cross-section of the Column,
ii) Sectional elevation of the column showing all reinforcement details.

PART –B (42 Marks)

3 a) Explain the terms balanced, over reinforced and under reinforced sections in bending. [6M]
b) What is meant by 'Limit State'? Discuss the different 'limit states' to be considered in reinforced concrete design. [8M]

4 A simply reinforced beam of size 250 mm wide and 450 mm effective depth carries a uniformly distributed load of 22 kN/m including its own weight. Effective span is 7 m. The reinforcement consists of 3-25 mm diameter at the centre and one bar is curtailed 900 mm from support. Design the shear reinforcement for the beam. [14M]

5 Design a continuous R.C slab for a hall 6.5 m wide and 13.5 m long. The slab is supported on RCC beams, each 240 mm wide which are monolithic. The ends of the slab are supported on walls with 230 mm thick. Design the slab for a live load of 3 kN/m^2. Assume the floor finish weight to1.5 kN/m^2. Use M20 grade of concrete and Fe 415 steel. [14M]

6 Design a square isolated footing of uniform thickness for a reinforced concrete square column of size 450 mm transmitting an axial service load of 1500 kN. The safe bearing capacity at the site is 160 kN/m^2 and the materials to be used are M20 grade concrete and HYSD steel bars of grade Fe415. Draw reinforcement details. [14M]

7 a) What are the major factors that affect deflection? Explain. [6M]
b) What are the various remedial measures for control of cracking? Explain. [8M]

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Code No: R1631014 **R16** SET - 2

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

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 (28 Marks)

1 Design a T- Beam for the following data: [28M]
Span (ends are simply supported) = 7 m, Spacing of the beams = 3.5 m,
Superimposed load= 3.5 kN/m, Thickness of slab= 120 mm,
Weight of walls on the beam = 17 kN/m, Width of web = 250 mm, Total depth = 550 mm.
Use M20 grade of concrete and Fe 500 grade steel.
Design the beam for shear reinforcement also. Check the beam for all necessary conditions.
Draw to a suitable scale:
i) longitudinal section showing the reinforcement details,
ii) Cross-section of the beam at salient points, showing the reinforcement details.

(OR)

2 A rectangular column 450 mm x 600 mm transverse a dead load of 950 kN and a live load of 1350 kN without any moment. The safe bearing capacity of soil is 140 kN/m^2. Use M20 grade of concrete and HYSD steel bars of grade Fe 415. Design the rectangular footing to support the column. Draw to a suitable scale: [28M]
i) Plan of the footing,
ii) Sectional elevation of the footing showing the reinforcement details.

PART –B (42 Marks)

3 a) Discuss the merits and demerits of working stress method and ultimate load method. [6M]
b) Explain the terms balanced, over reinforced and under reinforced sections in bending. [8M]

4 A simply reinforced beam of size 300 mm wide and 550 mm effective depth carries a uniform dead load of 20 kN/m and uniformly distributed load of 60 kN/m including its own weight. Effective span is 6 m. The reinforcement consists of 5-25 mm diameter HYSD steel bars of grade Fe 415. Out of these, two bars can be bent up at 1 m distance from the support. Design the shear reinforcement for the beam. [14M]

5 Design a R.C slab for a room 5 m x 6 m of size and it is simply supported on all four edges, with corners held down. The slab carries a super imposed load of 4000 N/mm^2, inclusive of floor finishes. Use M20 grade of concrete, Fe 415 steel and IS code method. [14M]

6 Design an axially loaded tied column with an unsupported length of 4 m. the column is fixed at one end and pinned at the other end. The column has to carry a factored load of 1600 kN. Use M25 grade of concrete and Fe 500 grade steel. Sketch the reinforcement details. [14M]

7 a) Why is it necessary to limit deflections in the reinforced concrete flexural members? Explain. [6M]
b) What are the various remedial measures for control of cracking? Explain. [8M]


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

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

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 (28 Marks)

1 A rectangular column 300 mm x 500 mm, reinforced with 6-25 mm diameter bars with Fe415 steel and M25 concrete, subjected a factored load of 1000 kN and a factored uni-axial moment Mux = 110 kN-m (with respect to the major axis) at the column base. The safe bearing capacity of soil is 190 kN/m^2 at a depth of 1.5 m below GL. Assume M20 grade of concrete and Fe415 steel for the footing. [28M]
Design the rectangular footing to support the column.
Draw to a suitable scale:
i) Plan of the footing,
ii) Sectional Elevation of the footing showing the reinforcement details.

(OR)

2 Design a continuous RC slab for a hall 6.5 m and 13.5 m long. The slab is supported on RCC beams each 240 mm wide which are monolithic. The ends of the slab are supported on walls, 230 mm wide. Design the slab for a live load of 2.5 kN/m^2. Assume the weight of roof finishing equal to 1.5 kN/m^2. Use M20 grade of concrete and Fe 415 steel. [28M]
Draw to a suitable scale:
(i) the reinforcement of the slab in plan (view)
ii) Cross-section of the slab including beams with reinforcement

PART –B (42 Marks)

3 a) Discuss the merits and demerits of working stress method and ultimate load method. [6M]
b) What is meant by 'Limit State'? Discuss the different 'limit states' to be considered in reinforced concrete design. [8M]

4 A simply reinforced beam of span is 6 m c/c, carries a uniform dead load of 20 kN/m and uniform live load of 35 kN/m (including beam weight). The beam size 300 mm wide and 600 mm effective depth. The reinforcement consists of 4-25 mm diameter steel bars of grade Fe 415. Design the shear reinforcement for the beam. Use 10 mm diameter stirrups. [14M]

5 Design a T-beam section with a flange width of 1250 mm, a flange depth of 100 mm, a web width of 250 mm, and an effective depth of 500 mm, which is subjected to a factored moment of 600 kN-m. The concrete mix to be used is of grade M20 and steel is of grade Fe415. [14M]

6 Design an axially loaded tied column with an unsupported length of 3.7 m. the column is fixed at one end and pinned at the other end. The column has to carry a factored load of 2000. Use M25 grade of concrete and Fe 500 grade steel. Sketch the reinforcement details. [14M]

7 The section of a cantilever beam (300 mm x 540 mm effective), designed for a span of 4 m with 3-28 mm Φ at top and 3-20 mm Φ with bottom steel reinforcement. The beam has been designed for a B.M of 200 kN-m at the support under service loads, of which 60% is due to permanent loads. The load is U.D.L on the span. Assume M20 grade of concrete and Fe 415 steel. Calculate [14M]

i) The max. Short-term elastic deflection,

ii) The short-term deflection due to live loads. Assuming $\epsilon_{cs} = 0.0004$ and

iii) The max. Deflection due to creep, assuming $\theta = 1.63$.

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Code No: R1631014 **R16** SET - 4

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

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 (28 Marks)

1 Design a slab supported on all edges over a room of size 4 m x 5.5 m. Two adjacent edges of the slab are discontinuous. The slab shall be used as class room floor and a floor finish with cement concrete of 20 mm thick is provided over the slab. The slab is supported on masonry walls 230 mm thick. Use M20 grade of concrete and HYSD steel bars of grade Fe 415. [28M]

Draw to a suitable scale:

i) the cross-section of the slab showing main reinforcement, and

ii) distribution reinforcement details.

(OR)

2 Design the reinforcement for a column with $l_{ex} = l_{ey} = 3.5$ m and a size 300 mm x 500 mm, subject to a factored axial load of 1200 kN with biaxial moments of 160 kN-m and 100 kN-m with respect to the major and minor axis respectively. Assume M25 grade of concrete and Fe415 grade steel. [28M]

Draw to a suitable scale:

i) Cross-section of Column with main reinforcement and stirrups,

ii) Sectional Elevation showing the reinforcement details.

PART –B (42 Marks)

3 a) What are the different methods in the design of R.C.C? [5M]

b) Explain the terms balanced, over reinforced and under reinforced sections in bending with stress-strain diagrams. [9M]

4 A reinforced concrete rectangular beam section of size 300 mm x 800 mm effective depth is reinforced with 6–25 mm diameter bars. The beam caries a factored load of 70 KN/m over a clear span of 7 m. Design the shear reinforcement, if two bars are bent up at a distance of 1 m from the support. Use 8 mm diameter stirrups. Assume M20 concrete and Fe415 steel. [14M]

5 Design a rectangular beam section, 300 mm wide and 600 mm deep (overall) subject to an ultimate twisting moment of 60 kN-m, combined with an ultimate bending moment of 80 kN-m and an ultimate shear of 50 kN. Assume M20 grade of concrete and Fe 415 steel, with moderate exposure condition. [14M]

6 Design an isolated footing for a reinforced concrete column of size 300 mm x 350 mm carrying an axial load of 800 KN. The safe bearing capacity of the soil at site is 175 kN/m^2, with angle of repose of 30 degrees. The materials to be used are: concrete of grade M20 and HYSD steel bars of grade Fe415. The unit weight of soil at the site is 19.5 kN/m^3. [14M]

7 a) What are the various remedial measures for control of cracking? [5M]

b) A doubly reinforced beam of 250 mm wide x 550 mm overall depth is reinforced with 4 bars of 20 mm diameter on tensile face and 2 bars of 16 mm diameter on the compression face. The effective cover is 50 mm. The beam spans over 8 m. Check the deflection control, if M20 grade of concrete and Fe 415 steel is used. [9M]

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