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

III B. Tech I Semester Regular/Supplementary Examinations, October/November-2017
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 an L-beam for an office floor to suit the following data: [28M]
Clear span = 7 m. Distance between column centre to centre = 7.45 m
Spacing of T-beam ribs = 2.75 m centre to centre
Thickness of slab = 100 mm
Materials: M 20 grade concrete and Fe-415 steel. L-Beams are supported on RC columns. Sketch the details of reinforcements in the beam.

2 Design the reinforcements in a short column 400 mm by 600 mm subjected to an ultimate axial load of 1600 kN together with ultimate moments of 120 kN.m and 90 kN.m about the major and minor axis respectively. Adopt M-20 grade concrete and Fe-415 HYSD bars. Sketch the reinforcement details. [28M]

PART –B

3 Design a two way slab for a residential roof to suit the following data: [14M]
Size of roof = 4.5 m by 6.0 m, edge conditions: simply supported on all the sides on load bearing masonry walls 300 mm thick without any provision for torsion at corners.
Materials: M-20 grade concrete and Fe-415 HYSD bars.

4 A reinforced concrete T-beam section with the details given below is subjected to an external working bending moment of 320 kNm. The characteristic strengths of concrete and reinforcement are 20 and 415 N/mm^2 respectively. Determine whether the cross section is structurally safe in limit state of strength for the moment given. The data is: A_{st} = 2918 mm^2, b_f = 1.6 m, t = 0.12 m, d = 0.51 m. [14M]

5 Design a continuous reinforced concrete beam of rectangular section to support a dead load of 10 kN/m and live load of 12 kN/m over 3 spans of 6m each. The ends are simply supported. Adopt M-20 grade concrete and Fe-415 HYSD bars. Sketch the details of reinforcements in the beam. [14M]

6 A reinforced concrete column 400 mm by 400 mm supports an axial service load of 1000 kN. The safe bearing capacity of the soil at site is 200 kN/m^2. Adopting M-20 grade concrete and Fe-415 HYSD bars design a suitable footing for the column and sketch the details of reinforcements. [14M]

7 Explain the following terms as per IS: 456:2000: [14M]
(a) Limit state of collapse in safety requirements. (b) Characteristic strength of materials. (c) Partial safety factors. (d) Imposed loads. (e) Limit state of collapse in flexure. (f) Limit state of collapse in shear. (g) Limit state of collapse in torsion.

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

III B. Tech I Semester Regular/Supplementary Examinations, October/November-2017
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 combined footing for the two columns of a multi story building using the following data: [28M]
Size of column = 400 mm by 400 mm. Axial load on each column = 800 kN
Spacing of columns = 5 m centre to centre
SBC of soil = 200 kN/m^2 Materials: M20 grade concrete and Fe-415 grade HYSD bars.

2 A short column located at the corner of a storied building is subjected to an axial factored load of 2000 kN together with factored moments of 75 kN.m and 60 kN.m acting in perpendicular planes. The size of the column is fixed as 450mm by 450 mm. Adopting concrete of M-20 grade and Fe-415 HYSD bars. Design suitable reinforcements in the column section. Sketch the reinforcement details. [28M]

PART –B

3 A simply supported slab has a clear span of 2.1 m and is supported on walls 400 mm thick along the edges. If the live load on the slab is 4 kN/m^2, and the floor finish weighs 0.6 kN/m^2. Design the slab using M-20 grade concrete and Fe-415 HYSD bars. [14M]

4 Determine the limit moment capacity of a singly reinforced concrete T-section for the following details: A_{st} = 1256 mm^2, b_f = 1000 mm, t = 120 mm, b_w = 250 mm, d = 500 mm, f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2. [14M]

5 Design a singly reinforced concrete beam to suit the following data: [14M]
Clear span = 4 m. width of supports = 300 mm brick walls
service live load = 5 kN/m
materials: M20 grade concrete and Fe -415 HYSD bars

6 Design a reinforced concrete circular footing for a circular column of 300 mm diameter supporting a design ultimate load of 750 kN. The safe bearing capacity of the soil at site is 200 kN/m^2. Adopt M-20 grade concrete and Fe-415 HYSD bars. [14M]

7 Explain the design concept of limit state of collapse in flexure, limit state of collapse in shear and detail the assumptions in limit state of collapse in flexure. [14M]

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

III B. Tech I Semester Regular/Supplementary Examinations, October/November-2017
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 long column. An axial load on a column including the self weight is 700 kN and its effective length is 5.275 m. The size of the column is fixed as 300 mm by 300 mm. Design the column with M20 concrete and Fe 415 HYSD bars. Sketch the reinforcement details. [28M]

2 Design the longitudinal and lateral reinforcements in a short column of size 300 mm by 500 mm subjected to an ultimate axial load of 1200 kN with ultimate moments of 80 kN.m and 60 kN.m about the major and minor axis respectively. Adopt M-25 concrete and Fe-415 HYSD bars. [28M]

PART –B

3 Design a continuous one way slab for an office floor. The slab is continuous over tee beams spaced at 4 m. Assume live load of 4 kN/m^2 and adopt M-20 grade concrete and Fe-415 HYSD bars. [14M]

4 Determine the limit moment capacity of reinforced concrete T-section for the following details: A_{st} = 4900 mm^2, b_f = 1200 mm, t = 150 mm, b_w = 400 mm, d = 600 mm, f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2. [14M]

5 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 M-20 grade concrete and Fe-415 HYSD bars and design the beam to satisfy the limit states of collapse and serviceability. [14M]

6 Design a combined column footing with a strap beam for two reinforced concrete columns of size 300 mm by 300 mm spaced 4 m centre to centre and each supporting a service axial load of 500 kN. The safe bearing capacity of soil at site is 150 kN/m^2. Adopt M-20 grade concrete and Fe-415 HYSD bars. [14M]

7 Explain the following terms as per IS: 456:2000 [14M]
a) Minimum shear reinforcement. b) Development length
c) Longitudinal reinforcement. d) Transverse reinforcement

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Code No: RT31013

R13

SET - 4

III B. Tech I Semester Regular/Supplementary Examinations, October/November-2017
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 A long reinforced column of 7 m effective height is subjected to a working axial live load of 600 kN and bending moment of 300 kN.m. Design a column by limit state design with width not exceeding 300 mm using M-20 concrete and HYSD Fe-415 bars. Provide unequal reinforcement at the tension and compression faces of the column. Sketch the reinforcement details. [28M]

2 Design a combined column footing for two reinforced concrete columns using the following data: [28M]
Size of columns: 300 mm by 300 mm. Spacing of columns = 4 m.
load transmitted by each columns = 500 kN SBC of soil = 150 kN/m^2
Adopt M-20 grade concrete and Fe 415 HYSD bars.

PART –B

3 Design a two way slab for a room of size 4 m by 5 m with discontinuous simply supported edges on all the sides with corners prevented from lifting to support a live load of 4 kN/m^2. Adopt M-20 grade concrete and Fe-415 HYSD bars. [14M]

4 A simply supported beam of an effective span 12 m is subjected to uniformly distributed live load of 20 kN/m. Design a reinforced concrete T-section subjected to limitations: b_f = 1500 mm, t = 160 mm, h = 800 mm, b_w = 400 mm. f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2. [14M]

5 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 M-20 grade concrete and Fe-415 bars. Sketch the details of reinforcements in the continuous beams. [14M]

6 Design an isolated footing for a column 350 mm by 600 mm reinforced with 6 bars of 25 mm diameter and is subjected to a service load of 600 kN and a service moment of 80 kNm with respect to the major axis at the column base. The safe bearing capacity of soil is 200 kN/m^2. Adopt M-20 grade concrete and Fe-415 HYSD bars. [14M]

7 Explain in detail the Indian standard code recommendations for design of footings as per IS: 456: 2000. [14M]

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