Code No: 09A50102 | R09 | SET-1

B. Tech III Year I Semester Examinations, December-2011
DESIGN OF REINFORCED CONCRETE STRUCTURES
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) What is Stress block as per the Limit state method? Derive the stress block parameters from first principles.

b) Design flexural reinforcement for an RC beam of size 300mm wide and 500mm deep to resist an ultimate moment of 245 kNm. Assume moderate exposure condition. Use M25 concrete and Fe 500 grade steel. Adopt Limit State method. [7+8]

2. A floor system consists of a slab 100mm thick, cast integrally on beams spaced at 4.5 m centre to centre and spanning over 6 m. The beam has a width of 300 mm and the total depth of the beam including the thickness of slab is 550mm. Assume mild exposure condition. The floor is to be designed for a service load of 3 kN/m^2 and 0.8 kN/m^2 for finishes excluding the self weight of the floor system. Design flexural and shear reinforcement for one intermediate T-beam using Limit State method. Use M25 concrete and Fe415 steel. [15]

3.a) Explain the concept of 'bond' in RC structures, with a sketch.

b) Design the torsional reinforcement in a rectangular beam section 360 × 780 mm deep (overall depth) subjected to an ultimate twisting moment of 180 kNm, combined with an ultimate hogging bending moment of 260 kNm and ultimate shear of 170 kN. Use M30 concrete and Fe 500 steel. Assume mild exposure condition. Sketch the reinforcement details. [7+8]

4. Design a R.C. slab for a room measuring 5 m × 6 m. The slab carries a live load of 3.5 kN/m^2. The slab is simply supported at all the four edges with corners free to lift. The width of the supporting walls is 300 mm. Use M 25 grade concrete and Fe 415 grade steel. Sketch the reinforcement details. Assume mild exposure condition. [15]

5. Design a rectangular isolated sloped footing for a column of size 360 mm × 660 mm carrying an axial load of 2500 kN. The S.B.C. of the soil is 280 kN / m^2 . Use M 30 grade concrete and Fe 500 grade steel. Sketch the reinforcement details. Assume moderate exposure condition. [15]

6. Design a short helically reinforced column of unsupported length 3.8 m to carry an axial service load of 1200 kN. Use M 25 concrete and Fe 250 grade steel. Sketch the reinforcement details. Assume moderate exposure condition. [15]

7.a) Distinguish between short-term deflection and long-term deflection in RC members.

b) A one-way slab has been designed for a simply supported effective span of 4.6 m with an overall depth of 160 mm and clear cover of 20 mm, M25 concrete and Fe 500 steel. The dead loads are taken as 4.0 kN/m^2 and the live loads as 2.0 kN/m^2. The longitudinal bars are designed as 12 mm dia @ 150 c/c. verify the adequacy of the thickness provided,
i) Applying the limiting span/effective depth ratio;
ii) Actual calculation of total deflections. [7+8]

8. The clear dimensions of a staircase hall are 28 m × 4.4 m. The floor to floor height is 3.6 m. The landing slabs span in the same direction as the stair and are supported by the walls at the ends. The stair is used in a residential building. Design a dog-legged staircase. Use M 30 concrete and Fe 500 steel. Sketch the reinforcement details. Sketch the reinforcement details. Assume moderate exposure condition. [15]

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Code No: 09A50102 | R09 | SET-2

B. Tech III Year I Semester Examinations, December-2011
DESIGN OF REINFORCED CONCRETE STRUCTURES
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) Explain the balanced, under-reinforced and over-reinforced sections as per Working Stress and Limit State Methods.

b) Design flexural reinforcement for an RC beam of size 250 mm wide and 450 mm deep to resist an ultimate moment of 215 kNm. Assume moderate exposure condition. Use M25 concrete and Fe 415 grade steel. Adopt Limit State method. [7+8]

2.a) Explain the effective flange width of a T-beam showing the actual and assumed stress distribution.

b) A floor system consists of a slab 110mm thick, cast integrally on beams spaced at 3.5 m centre to centre and spanning over 7 m. The beam has a width of 300 mm and the total depth of the beam including the thickness of slab is 600mm. Assume mild exposure condition. The floor is to be designed for a service load of 4 kN/m^2 and 0.8 kN/m^2 for finishes excluding the self weight of the floor system. Design flexural and shear reinforcement for one intermediate T-beam using Limit State method. Use M25 concrete and Fe415 steel. [7+8]

3.a) Explain the concept of 'Shear' in RC beams, with a sketch.

b) Design the torsional reinforcement in a rectangular beam section 360 × 800 mm deep (overall depth) subjected to an ultimate twisting moment of 160 kNm, combined with an ultimate hogging bending moment of 230 kNm and ultimate shear of 120 kN. Use M30 concrete and Fe 415 steel. Assume mild exposure condition. Sketch the reinforcement details. [7+8]

4. Design a R.C. slab for a room measuring 4.5 m × 6 m. The slab carries a live load of 3 kN/m^2. The slab is simply supported at all the 4 edges with corners free to lift. The width of the supporting walls is 300 mm. Use M 30 grade concrete and Fe 415 grade steel.
Sketch the reinforcement details. Assume mild exposure condition. [15]

5. Design a rectangular isolated sloped footing for a column of size 350 mm x 650 mm carrying an axial load of 2300 kN. The S.B.C. of the soil is 260 kN / $m^{2.}$ Use M 25 grade concrete and Fe 415 grade steel. Sketch the reinforcement details. Assume mild exposure condition. [15]

6. Design an axially loaded tied column with an unsupported length of 4.2 m. The column is fixed at one end and pinned at the other end. The column has to carry a factored load of 2400 kN. Use M 25 grade concrete and Fe 415 grade steel. Sketch the reinforcement details. Assume moderate exposure condition. [15]

7.a) Distinguish between short-term deflection and long-term deflection in RC members.

b) A one-way slab has been designed for a simply supported effective span of 4.5 m with an overall depth of 170 mm and clear cover of 20 mm, M25 concrete and Fe 415 steel. The dead loads are taken as 4.0 kN/m^2 and the live loads as 2.0 kN/m^2. The longitudinal bars are designed as 10 mm diameter @ 150 c/c. verify the adequacy of the thickness provided,
i) Applying the limiting span/effective depth ratio;
ii) Actual calculation of total deflections. [7+8]

8. The clear dimensions of a staircase hall are 24 m x 4.75 m. The floor to floor height is 3.6 m. The landing slabs span in the same direction as the stair and are supported by the walls at the ends. The stair is used in a residential building. Design a dog-legged staircase. Use M 25 concrete and Fe 415 steel. Sketch the reinforcement details. Sketch the reinforcement details. Assume moderate exposure condition. [15]

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Code No: 09A50102 | R09 | SET-3

B. Tech III Year I Semester Examinations, December-2011
DESIGN OF REINFORCED CONCRETE STRUCTURES
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) What is Stress block as per the Limit state method? Derive the stress block parameters from first principles.

b) Distinguish among the following sections, with neat sketches, as per working stress and Limit state methods:
i) Balanced (ii) Under-reinforced (iii) Over-reinforced. [7+8]

2. A floor system consists of a slab 120mm thick, cast integrally on beams spaced at 4.2 m centre to centre and spanning over 7 m. The beam has a width of 330 mm and the total depth of the beam including the thickness of slab is 600mm. Assume mild exposure condition. The floor is to be designed for a service load of 3.5 kN/m^2 and 1.0 kN/m^2 for finishes excluding the self weight of the floor system. Design flexural and shear reinforcement for one intermediate T-beam using Limit State method. Use M30 concrete and Fe415 steel. Sketch the reinforcement details. [15]

3.a) Explain the concept of 'bond' in RC structures, with a sketch.

b) Design the torsional reinforcement in a rectangular beam section 360 × 800 mm deep (overall depth) subjected to an ultimate twisting moment of 190 kNm, combined with an ultimate hogging bending moment of 290 kNm and ultimate shear of 180 kN. Use M30 concrete and Fe 500 steel. Assume moderate exposure condition. Sketch the reinforcement details. [7+8]

4. Design a R.C. slab for a room measuring 5 m × 8m. The slab carries a live load of 3.3 kN/m^2. The slab is simply supported at all the four edges with corners free to lift. The width of the supporting walls is 300 mm. Use M 30 grade concrete and Fe 415 grade steel. Sketch the reinforcement details. Assume mild exposure condition. [15]

5. Design a rectangular isolated sloped footing for a column of size 360 mm × 650 mm carrying an axial load of 2900 kN. The S.B.C. of the soil is 300 kN / m^2. Use M 30 grade concrete and Fe 500 grade steel. Sketch the reinforcement details. Assume moderate exposure condition. [15]

6. Design a short helically reinforced column of unsupported length 3.6 m to carry an axial service load of 1200 kN. Use M 30 concrete and Fe 415 grade steel. Sketch the reinforcement details. Assume moderate exposure condition. [15]

7.a) Distinguish between short-term and long-term deflections in RC members.

b) A simply supported one-way slab 180 mm thick having an effective span of 4.2 m is reinforced with 10 mm diameter bars spaced at 125 mm c/c at an effective cover of 25 mm. The slab is subjected to a live load of 4.2 kN/m^2 and a surface finish of 1.5 kN/m^2. Use M30 concrete and Fe 500 grade steel. Assume ultimate shrinkage strain = 0.0003 and creep coefficient = 1.6. Estimate the only the long-term deflection. [7+8]

8. The clear dimensions of a staircase hall are 30 m × 5 m. The floor to floor height is 3.6 m. The landing slabs span in the same direction as the stair and are supported by the walls at the ends. The stair is used in a residential building. Design a dog-legged staircase. Use M25 grade concrete and Fe 500 steel. Sketch the reinforcement details. Sketch the reinforcement details. Assume moderate exposure condition. [15]

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Code No: 09A50102 | R09 | SET-4

B. Tech III Year I Semester Examinations, December-2011
DESIGN OF REINFORCED CONCRETE STRUCTURES
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) Derive the stress-block parameters from first principles.
b) Design flexural reinforcement for an RC beam of size 280 mm wide and 450 mm deep to resist an ultimate moment of 265 kNm. Assume moderate exposure condition. Use M30 concrete and Fe 415 grade steel. Adopt Limit State method. Assume mild exposure condition. [7+8]

2.a) Explain the effective flange width of a T-beam showing the actual and assumed stress distribution.
b) A floor system consists of a slab 110mm thick, cast integrally on beams spaced at 3.6m centre to centre and spanning over 8 m. The beam has a width of 300 mm and the total depth of the beam including the thickness of slab is 600mm. Assume mild exposure condition. The floor is to be designed for a service load of 3.8 kN/m^2 and 0.9 kN/m^2 for finishes excluding the self weight of the floor system. Design flexural and shear reinforcement for one intermediate T-beam using Limit State method. Use M30 concrete and Fe415 steel. Assume mild exposure condition. [7+8]

3.a) Explain the concept of 'Shear' in RC beams, with a sketch.
b) Design the torsional reinforcement in a rectangular beam section 350 × 760 mm deep (overall depth) subjected to an ultimate twisting moment of 160 kNm, combined with an ultimate hogging bending moment of 250 kNm and ultimate shear of 140 kN. Use M30 concrete and Fe 415 steel. Assume mild exposure condition. Sketch the reinforcement details. [7+8]

4. Design a R.C. slab for a room of size 4 m × 6 m. It carries a live load of 3.5 kN/m^2 and is finished with 75 mm thick granolithic finishing, whose unit weight is 21 kN/m^3. The slab is simply supported on all the four edges with corners free to lift. The width of the supporting walls is 300 mm. Check for deflection and for shear need not be carried out. Use M 25 concrete and Fe 250 steel. Assume mild environment. Sketch the reinforcement details. [15]

5. A R.C.C. column of size 400 mm × 400 mm carries a characteristic load of 960 kN. The S.B.C. of the soil is 230 kN/m^2. Design an isolated square footing. Use M 25 concrete and Fe 415 steel. Sketch the reinforcement details. Assume moderate exposure condition. [15]

6. Design the reinforcement for a column having a cross-section of 300 × 520 mm and effective length of 3.6 m subjected to a factored axial load 1280 kN with biaxial moments of 200 kNm and 120 kNm with respect to major and minor axes respectively. Use M30 concrete and Fe 415 steel. Sketch the reinforcement details. Assume moderate exposure condition. [15]

7.a) What are the various remedial measures for control of cracking ?

b) A doubly reinforced beam of rectangular section 300 mm wide and 560mm overall depth is reinforced with 4 bars of 25 mm diameter on the tension face and 2 bars of 16 mm diameter on the compression face. Assume mild exposure condition. The beam spans over 8 m. Estimate the short-term deflection and long term deflection only due to shrinkage of concrete. Use M30 concrete and Fe 415 steel. [7+8]

8. The clear dimensions of a staircase hall are 26 m × 4.75 m. The floor to floor height is 3.6 m. The landing slabs span in the same direction as the stair and are supported by the walls at the ends. The stair is used in a residential building. Design a dog-legged staircase. Use M 30 concrete and Fe 415 steel. Sketch the reinforcement details. Sketch the reinforcement details. Assume moderate exposure condition. [15]

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