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Hall Ticket Number:

CE324(CEEL05) (R20)

B.TECH. DEGREE EXAMINATION, SEPTEMBER-2024

Semester VI [Third Year] (Supplementary)

DESIGN OF REINFORCED CONCRETE STRUCTURES

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) Find the development length of 20 mm Fe415 bars in compression with bond strength 1.6 N/ mm^2. CO1
   (b) What is the minimum clear cover for main bars in a simply supported beam as per IS code. CO1
   (c) What is the percentage of distribution steel used in one way slabs? CO1
   (d) What are the benefits of dog-legged staircase? CO2
   (e) When one way slab is subjected to loading in what direction the slab will bend? CO2
   (f) List the components of flat slab. CO2
   (g) What is tread and rise in staircase? CO2
   (h) Why flat slabs are designed? CO2
   (i) When do we use strap footing? CO3
   (j) What is the minimum clear cover for main bars in footings as per IS code? CO3
   (k) When do we use pile footing? CO3
   (l) What is the purpose of a retaining wall? CO4
   (m) Draw the diagram of cantilever retaining wall. CO4
   (n) Explain counterfort retaining wall? CO4

UNIT – I

2. Design a cantilever beam of span 4 m subjected to an udl of 22 kN/m. Use M25 grade concrete and Fe415 steel. CO1

(OR)

3. Design a continuous beam for flexure which is supported at A, B, C, D, E each span of 6 m. Consider dead load of 30 kN/m and live load of 45 kN/m using IS coefficients. Use M25 grade concrete and Fe415 steel. CO1

UNIT – II

4. Design a dog-legged staircase for a residential building in which vertical distance between floors is 4.1 m and hall is 3.2 m x 5.4 m. Live load is 2.50 kN/m^2. Use M25 and Fe415 steel. CO2

(OR)

5. A flat slab is supported on columns spaced at 5.5 m c/c apart in both directions. Columns size are 450 mm x 450 mm and column heads are 600 mm x 600 mm. Dead load and live loads are taken as 2.5 and 3.0 kN/m^2 respectively. The height of floor is 4.7 m. Design the slab. Use M25 and Fe 415 steel. CO2

UNIT – III

6. Design a square footing to carry a load of 1150 kN from a column size 300 mm x 450 mm. Safe Bearing Capacity of soil is 165 kN/ m^2. Unit weight of the soil is 17 kN/ m^3. The materials are M20 grade and Fe415 steel. CO3

(OR)

7. Design a combined footing for two interior columns carrying axial loads of 950 kN and 1250 kN. Column A is 300 mm x 300 mm and column B is 450 mm x 450 mm and are spaced at 5 m c/c. They are reinforced with 4-20 mm diameter bars of Fe415 steel. Use M20 grade concrete. CO3

UNIT – IV

8. Design and perform stability checks for a cantilever retaining wall to support a soil cut of 7 m above the ground level. The SBC of soil is 175 kN/m^2. Unit weight of the soil is 20 kN/m^3. The angle of repose is 27° and coefficient of friction between base slab and soil is 0.45. CO4

(OR)

9. A cantilever retaining wall of total height 5 m, base slab width 4.25 m, thickness of base 450 mm, width of stem at top 225 mm and 600 mm at bottom and projection of toe is 650 mm. Unit weight of the soil is 16 kN/ m^3. The angle of repose is 33° and coefficient of friction between base slab and soil is 0.4 and Safe Bearing Capacity of soil is 180 kN/ m^2. Estimate the reinforcement required in stem and base slab. Use M25 and Fe415 steel. CO4

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9. Design a cantilever retaining wall to retain an earth embankment 4 m high above ground level. The density of the earth is 18 kN/m^3 and its angle of repose is 30°. The embankment is horizontal at the top. The safe bearing capacity of soil may be taken as 200 kN/m^2 and the coefficient of friction between soil and concrete 0.5. Adopt M20 Grade concrete and Fe415 HYSD bars. CO4

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Hall Ticket Number:

CE412(CEEL05) (R20)

B.TECH. DEGREE EXAMINATION, MAY-2024

Semester VII [Fourth Year] (Supplementary)

DESIGN OF REINFORCED CONCRETE STRUCTURES

Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) Mention two advantages of introducing compressive steel reinforcement in reinforced concrete beams. CO1
   (b) How to overcome torsion in RCC Beams? CO1
   (c) Write any two advantages of the Limit State Method over the Elastic Method of design. CO1
   (d) Enumerate the balanced section. CO1
   (e) The vertical members fixed between the steps and handrail are known as _____. CO2
   (f) Write any two general features of a two-way slab. CO2
   (g) What is the maximum % of steel reinforcement for a slab in the limit state design method? CO2
   (h) Enumerate the components in a flat slab. CO2
   (i) When do you prefer combined footing? CO3
   (j) How do you calculate the depth of footing using Rankine's formula? CO3
   (k) What is one-way and two-way shear in footings? CO3
   (l) List the types of combined footings. CO3
   (m) What are the major functions of a retaining wall? CO4
   (n) List the various types of failures in a retaining wall. CO4

UNIT – I

2. (a) Explain Balanced Section as per the limit state method for the design of reinforced concrete structures. (4M) CO1

(b) Determine the moment of resistance of a doubly reinforced concrete beam section, 300 mm wide and 400 mm effective depth, reinforced with 2 bars of 16 mm diameter in the compression zone and 3 bars of 20 mm diameter in tension zone. Use M25 grade concrete and Fe500 steel. (10M) CO1

(OR)

3. Design a three-span continuous beam of typical interior idealized plane frame of the building.
   (i) The frames are spaced 5.5 m apart and 140 mm thick continuous slab is cast monolithically with beam.
   (ii) The thickness of floor finish is 40 mm.
   (iii) Size of column is 400 mm x 400 mm
   (iv) The beam has three equal span length of 6.1 m (Effective Span)
   (v) The floor has to support imposed load of 5 kN/m^2 at the service state.
   (vi) The unit weight of finishing material is 20 kN/m^3

   M20 grade concrete and HYSD steel of grade Fe415 to be used. CO1

UNIT – II

4. Design a two-way slab for an office floor of size 3.3 m x 4.5 m with discontinuous and simply supported edges on all the sides with the corners prevented from lifting and supporting a service live load of 4.2 kN/m^2. Adopt M20 grade concrete and Fe415 HYSD bars. CO2

(OR)

5. A flat slab floor has panels of 6.40 m x 5.40 m in X and Y directions between the center of columns which are 450 mm x 450 mm in size. It has an edge beam all around

the periphery of 250 mm x 500 mm which carries an exterior wall of weight 6 kN/m. The slab thickness is 150 mm and the characteristic live load it has to carry is 5.25 kN/m^2. The height of each storey is 3 m.
   (i) Analyze the exterior frame in 6.60 m direction and determine the distribution of moment.
   (ii) Determine the maximum torsional moment produced in the edge beam.

   Check whether the moment can be transferred to the column without transferring it on the edge beam. CO2

UNIT – III

6. Design the combined footing for two columns each of size 400 mm × 400 mm and spaced at 4.2 m centre-to-centre. Each column is required to support an ultimate load of 900 kN. The safe bearing capacity of the soil is 160 kN/m^2. Draw the reinforcement details. CO3

(OR)

7. Design a rectangular footing for a column 400 mm x 400 mm to transfer an axial load of 1000 kN. The Safe Bearing Capacity of Soil is 150 kN/m^2. CO3

UNIT – IV

8. Design a counterfort retaining wall to suit the following data: CO4
   (i) Height of wall above ground = 6 m
   (ii) Safe bearing capacity of soil at site = 160 kN/m^2
   (iii) Angle of internal friction = 33 degrees
   (iv) Density of soil = 16 kN/m^3
   (v) Spacings of Counterforts = 3 n c/c.
   (vi) Use M20 Grade concrete and Fe415 HYSD bar.

   Sketch the details of reinforcements in the retaining wall.

(OR)

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CE412(CEEL05) (R20)

B.TECH. DEGREE EXAMINATION, DECEMBER-2023

Semester VII [Fourth Year] (Regular)

DESIGN OF REINFORCED CONCRETE STRUCTURES

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) The maximum area of tension reinforcement in beams shall not exceed_____%. CO1
   (b) Write any two assumptions of the Limit State Method. CO1
   (c) Distinguish between under-reinforced and over-reinforced sections. CO1
   (d) In what circumstances doubly reinforced beams are to be adopted? CO1
   (e) What is the advantage of a two-way slab over a one-way slab? CO2
   (f) How do you check the slabs for serviceability conditions? CO2
   (g) Explain the purpose of drop panels in flat slabs. CO2
   (h) What is punching shear in RCC footing? CO3
   (i) List the forces to be considered while designing a footing. CO3
   (j) When do you prefer combined footing? CO3
   (k) Why do we provide dowel bars in footings? CO3
   (l) In designing retaining walls, it is necessary to take care of _____ exerted by soil mass. CO4
   (m) Define surcharge load on a retaining wall. CO4
   (n) What is the purpose of providing a shear key in the retaining wall? CO4

UNIT – I

2. Design a rectangular RC beam in flexure and shear when it is simply supported on masonry walls 300 mm thick and 5 m apart (center to center) to support a distributed live load of 8 kN/m and a dead load of 6 kN/m in addition to its weight. Materials used are M20 grade concrete and Fe415 steel bars. Adopt the Limit State method of design. CO1

(OR)

3. Explain the codal recommendations for limit state design. State their significance. CO1

UNIT – II

4. Design a slab over a room of 5 m x 7 m as per IS code. The slab is supported on masonry walls all around with adequate restraint and the corners are held down. The live load is 330 N/m^2. The slab has a bearing of 150 mm on the supporting walls. CO2

(OR)

5. A flat plate with 7.50 m x 6.00 m panels on 500 mm x 500 mm columns has a slab thickness of 185 mm, designed for a total characteristic load (DL + LL) of 9.3 kN/m^2. Check the safety of the slab in shear if grade M25 concrete and Grade Fe415 steel are used for its construction. How can we increase the shear capacity of the slab? CO2

UNIT – III

6. Design the combined footing for two columns each of size 400 mm × 400 mm and spaced at 4.2 m centre-to-centre. Each column is required to support an ultimate load of 900 kN. The safe bearing capacity of the soil is 160 kN/m^2. Draw the reinforcement details. CO3

(OR)

7. Design a reinforced concrete raft foundation connecting the columns of a multistoried building. The columns are in a square grid 16 m x 16 m with their spacing 4 m apart. The SBC of soil at the site is 100 kN/m^2. The total service load on the column is 4800 kN. The columns are 400 mm x 400mm in section. Adopt M20 concrete and Fe415 Steel. Sketch the details of reinforcement in the raft foundation. CO3

UNIT – IV

8. Design a cantilever retaining wall to retain earth with a backfill sloped 20° to the horizontal. The top of the wall is 5.5 m above ground level. Assume the depth of the foundation as 1.20 m below ground level with a safe bearing capacity of 120 kN/m^2. The unit weight of backfill is 18kN/m^3 and an angle of shearing resistance of 35°. Also, assume the coefficient of friction between soil and concrete as 0.55. Adopt M20 concrete and Fe415 HYSD. CO4

(OR)

9. Design a counterfort retaining wall to support a bank of earth 4 m above ground level. The foundation depth may be taken as 1.50 m below ground level. The safe bearing capacity of soil at the site is 150 kN/m^2. The unit weight of soil may be taken as 16 kN/m^3 and angle of shearing resistance is 30°. Assume the value of the coefficient of friction as 0.55. Adopt M20 grade concrete and Fe415 HYSD steel bars. Sketch the reinforcement details of the reinforcements in the retaining wall. CO4

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Hall Ticket Number:

CE324(CEEL05) (R20)

B.TECH. DEGREE EXAMINATION, MAY-2024

Semester VI [Third Year] (Regular & Supplementary)

DESIGN OF REINFORCED CONCRETE STRUCTURES

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) What is the basic value of span to effective depth ratio for spans less than 10 m for stiffness criteria in case of continuous beams as per IS456:2000? CO1
   (b) What is the minimum clear cover for main bars in a simply supported beam as per IS code. CO1
   (c) What is the maximum B.M for a simply supported beam of span 'L' subjected to udl 'w' kN/m. CO1
   (d) What are the benefits of dog-legged staircase? CO2
   (e) In what direction one way slab will bend when subjected to load? CO2
   (f) List the components of dog-legged staircase. CO2
   (g) What is drop panel in flat slab? CO2
   (h) What are the advantages of flat slabs? CO2
   (i) When do we use combined footing? CO3
   (j) What is the minimum clear cover for main bars in footings as per IS code. CO3
   (k) List types of retaining walls. CO4
   (l) Mention different types of stability checks in design of retaining wall. CO4
   (m) When do we use retaining walls? CO4
   (n) What is the purpose of counterfort retaining wall? CO4

UNIT – I

2. Design a rectangular RCC beam of width 350 mm and having clear span of 7 m is simply supported on 400 mm wall. Beam is subjected to an imposed load of 18 kN/m. Use M25 grade concrete and Fe415 steel. CO1

(OR)

3. Design a continuous beam for flexure which is supported at A, B, C, D, E, each span of 6 m. Consider dead load of 45 kN/m and live load of 60 kN/m using IS coefficients. Use M20 grade concrete and Fe415 steel. CO1

UNIT – II

4. Design a dog-legged staircase for a residential building in which vertical distance between floors is 3.3 m and hall is 2.4 m x 4.8 m. Live load is 2.75 kN/m^2. Use M20 and Fe500 steel. CO2

(OR)

5. Design a one way continuous slab of 4 spans each of 4.5 m. Take Live load as 7.5 kN/m^2 and dead load as 12 kN/m^2. Use M25 and Fe415 steel. CO2

UNIT – III

6. Design a rectangular footing to carry a load of 1250 kN from a column size 250 mm x 400 mm. Safe Bearing Capacity of soil is 150 kN/m^2. Unit weight of the soil is 18 kN/m^3. The materials are M20 grade and Fe415 steel. CO3

(OR)

7. Design a combined footing for two interior columns carrying axial loads of 850 kN and 1050 kN. Column A is 250 mm x 250 mm and column B is 400 mm x 400 mm and are spaced at 4.0 m c/c. They are reinforced with 6-16 mm diameter bars of Fe415 steel. Use M25 grade concrete. CO3

UNIT – IV

8. Design a cantilever retaining wall to support a soil cut of 6 m above the ground level. The safe bearing capacity of soil is 165 kN/ m^2. Unit weight of the soil is 20 kN/ m^3. The angle of repose is 29° and coefficient of friction between base slab and soil is 0.5. Also perform stability checks. CO4

(OR)

9. A cantilever retaining wall of total height 5 m, base slab width 3.5 m, thickness of base 475 mm, width of stem at top 250 mm and 500 mm at bottom and projection of toe is 700 mm. Unit weight of the soil is 16 kN/m^3. The angle of repose is 31° and coefficient of friction between base slab and soil is 0.4 and safe bearing capacity of soil is 150 kN/m^2. Estimate the reinforcement required in stem and base slab. Use M20 and Fe500 steel. CO4

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