Reg. No. | | | | | | | | | | | | |

Question Paper Code : 71578

12/05/17 AN

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fifth Semester

Civil Engineering

CE 6505 — DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2013)

Time : Three hours Maximum : 100 marks

(Use Code Book IS 456 — 2000, Design Charts and Relevant Tables of SP 16)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write any two assumptions of limit state method.
2. Distinguish between under reinforced and over reinforced sections.
3. What is the advantage of two way slabs over one way slab?
4. Mention any two advantages of introducing compression steel in reinforced concrete beams.
5. How to overcome torsion on beams?
6. What do you understand by development length of bar?
7. Distinguish between braced and unbraced columns.
8. Name any two methods used for design of long columns.
9. What is punching shear in RCC footing?
10. What is one way and two way shear in footing?

PART B — (5 × 16 = 80 marks)

11. (a) Design a rectangular RC beam in flexure and shear when it is simply supported on masonry walls 300 mm thick and 5 m apart (centre to centre) to support a distributed live load of 8 kN/m and a dead load of 6 kN/m in addition to its own weight. Materials used are M20 grade of concrete and Fe 415 steel bars. Adopt working stress method of design.

Or

(b) Design the roof slab for a Hall size 4 m × 10 m by working stress method using M20 concrete and Fe 415 steel. The slab simply resting on 230 mm thick brick walls all around. Take the live load on the slab as 1.5 kN/m^2 and finish load as 2.25 kN/m^2.

12. (a) Design a two way slab for the following data:

Size = 7 m × 5 m

Width of the support = 300 mm

Edge condition = two short edges are discontinuous, live load = 5 kN/m²

Floor finish as 1 kN/m²

Use M20 concrete and Fe 415 steel.

Or

(b) A T beam slab floor of an office comprises of a slab 150 mm thick spanning between ribs spaced at 3 m centres. The effective span of the beam is 8 m. Live load on floor is 4 kN/m². Using M20 grade concrete and Fe 415 HYSD bars, design one of the intermediate T beams.

13. (a) Design the reinforcements required for a rectangular beam section with the following data

Use M20 concrete and Fe 415 steel. Adopt limit state design method.

Size of the beam = 400mm × 800 mm

Factored shear force = 100 kN

Factored tension = 50 kN

Factored bending moment = 120 kNm.

Or

(b) Design a rectangular beam section of 250 mm width and 500 mm overall depth subjected to ultimate values of bending moment of 40 kN-m, shear force of 40 kN, Torsion moment of 30 kN-m. Adopt effective cover of 50mm on top and bottom. Use M20 concrete and Fe 415 steel.

14. (a) Design the reinforcements in a circular column of diameter 300 mm to support a service axial load of 800 kN. The column has an unsupported length of 3 m and is braced against side away. The column is reinforced with helical ties. Adopt M20 grade concrete and Fe 415 HYSD bars.

Or

(b) Design the reinforcement in a short column 400 mm x 400 mm at the corner of a multistorey building to support an axial factored load of 1500 kN together with biaxial moments of 50 kNm acting in perpendicular planes. Adopt M20 grade concrete and Fe 415 HYSD bars.

15. (a) A rectangular RCC column of size 400 mm × 600 mm carrying an axial load of 1800 kN. If the safe bearing capacity of the soil is 150 kN/m². Design a suitable footing. Use M20 concrete and Fe 415 steel.

Or

(b) Design a suitable footing for a 500 mm × 500 mm square column transferring 100 kN axial load and a moment of 35 kN-m. The safe bearing capacity of soil is 190 kN/m² Use M 20 concrete and Fe 415 steel. Adopt limit state design method.

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 40805

30/04/18 (AN)

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Fifth Semester
Civil Engineering
CE 6505 – DESIGN OF REINFORCED CONCRETE ELEMENTS
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

IS 456-2000 and SP16 permitted.
Assume any missing data suitably.
Use of relevant BIS standards and Handbooks is permitted.
Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What are the advantages of ultimate method over elastic method ?
2. Define limit state of collapse and limit state of serviceability.
3. Differentiate under reinforced and over reinforced sections.
4. What are the different modes of shear failure in RC beams ?
5. Explain the check for shear and design of shear reinforcement in RC beams.
6. What is meant by anchorage length ?
7. What are slender columns ?
8. How do you calculate the depth of footing based on Rankine's formula ?
9. What are the types of combined footings ?
10. List out any two factors which affect the permissible stress of a masonry ?

PART – B (5×13=65 Marks)

11. a) A beam, simply supported over an effective span of 8 m carries a live load of 15 kN/m. Design the beam, using M20 concrete and Fe415 grade steel. Keep the width equal to half the effective depth. Use Working stress method of Design.

(OR)

b) A doubly reinforced beam with b = 250 mm and d = 500 mm has to carry a dead load moment of 80,000 Nm and a live load moment of 100,000 Nm. Using M20 concrete and Fe415 grade steel, calculate the required steel using Working stress method of Design.

12. a) A simply supported one way slab of 4 m span carries a live load of 3 N/m² and the load of floor finish as 1.25 kN/m². The slab, having a total depth of 150 mm is reinforced with 8 mm Φ bars @ 100 mm c/c at a nominal cover of 20 mm. Assuming a permanent load equal to dead load plus 20% of live load, compute the total maximum deflection and check it as per code requirements. Use M20 concrete and Fe415 steel.

(OR)

b) Design a R.C. slab for a room measuring 5 m × 6m size. The slab is simply supported on all the four edges, with corners held down and carries a superimposed load of 30 N/m², inclusive of floor finishes etc. Use M20 mix, Fe415 steel and IS code method.

13. a) A rectangular beam with b = 350 mm and d = 550 mm has a factored shear of 400 kN at the critical section near the support. The steel at the tension side of the section consists of four 32 mm dia bars which are continued to support. Assuming f_{ck} = 25 N/mm² and f_y = 415 N/mm², design the vertical stirrups for the section. Use Limit state method.

(OR)

b) Check for the development length at support of a doubly reinforced beam 400 mm × 750 mm (effective) the clear span of the beam is 5.25 m. The beam carries UDL of 46 kN/m (including self-weight). The beam is reinforced with 8 bars of 20 mm diameter (4 are bent up near support) on tension side and 4 bars of 16 mm diameter on compression side. Adopt M20 grade concrete and Fe415 HYSD bars.

14. a) Design a rectangular column of 4.5 m unsupported length, restrained in position and direction at both the ends, to carry an axial load of 1200 kN. Use M20 concrete and Fe415 steel.

(OR)

b) Design a circular column of diameter 400 mm with helical reinforcement subjected to a working load of 1200 kN. Use M25 concrete and Fe415 steel. The column has unsupported length of 3 m and it is effectively held in position at both the ends, but not restrained against rotation.

15. a) Design a square footing for a short axially loaded column of size 300 mm × 300 mm carrying 600 kN load. Use M20 concrete and Fe415 steel. SBC of soil is 180 kN/m². Sketch the details of reinforcement.

(OR)

b) Design a reinforced concrete raft foundation connecting the columns of a multistoried building. The columns are arranged in square grid 16 m × 16 m with their spacing 4 m apart. The SBC of soil at site is 100 kN/m². The total service load on the column is 4800 kN. The columns are 400 mm × 400 mm in section. Adopt M20 concrete and Fe415 bars. Sketch the details of reinforcements in the raft foundation.

PART – C (1×15=15 Marks)

16. a) i) Explain the step by step procedure of design of masonry walls. (8)

ii) How do you improve lateral load resisting capacity of masonry walls ? (7)

(OR)

b) Determine the reinforcement to be provided in a short column subjected to biaxial bending, with the following data : size of column = 400 × 600 mm. Concrete mix = M15. Characteristic strength of reinforcement = 415 N/mm². Factored load, Pu = 1600 kN. Factored moment acting parallel to the larger dimension, Mux = 120 kNm. Factored moment acting parallel to the shorter dimension, Muy = 90 kNm. Moments due to minimum eccentricity are less than the values given above.

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06/05/19 AN

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 52773

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fifth Semester

Civil Engineering

CE 6505 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulation 2013)

Time : Three hours Maximum : 100 marks

(Use Code Book IS 456 – 2000, Design Charts and Relevant Tables of SP 16)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write any two assumptions of limit state method.
2. Distinguish between under reinforced and over reinforced sections.
3. On what circumstances doubly reinforced beams are to be adopted.
4. Write any two general features of two way slab.
5. Determine the anchorage length for 20 mm diameter bar.
6. What is torsional shear?
7. What is meant by braced column?
8. How the compression failures occur in columns?
9. Why the dowel bars are provided in footing?
10. What is the necessity of providing combined footings?

PART B — (5 × 13 = 65 marks)

11. (a) Design a simply supported reinforced concrete beam to carry a bending moment of 50 kNm as doubly reinforced section by working stress design. Keep the width is equal to half the effective depth. (13)

Or

(b) Design a simply supported rectangular slab for a hall of size 4 m × 5 m to carry a UDL of 5 kN/m^2. Use working stress method.

12. (a) A T-beam, slab floor of an office comprises of a slab 150 mm thick spanning between ribs spaced at 3 m centres. The effective span of the beam is 8 m. Live load on floor is 4 kN/m². Using M 20 grade and Fe 415 HYSD bars. Design one of the intermediate tee beams. Use limit state method. (13)

Or

(b) Design a two way slab for an office floor size 3.5 m × 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 4.4 kN/m². Adopt M 20 grade and Fe 415 HYSD bars. (13)

13. (a) Design a shear of rectangular reinforced concrete beam section to carry a factored bending Moment of 220 kNm, factored shear force of 140 kN, and a factored torsional moment of 80 kNm. Use M 20 grade concrete and Fe 415 steel. (13)

Or

(b) A simply supported RC beam of size 300 × 500 mm effective is reinforced with 4 bars of 16 mm diameter HYSD steel of grade Fe415, Determine the anchorage length of the bars at the simply supported end if it is subjected to a factored force of 350 kN at the centre of 300 mm wide masonry support. The concrete mix of grade M20 is to be used. Draw the reinforcement details. (13)

14. (a) Design the reinforcements in a circular column of diameter 300 mm to support a service axial load of 800 kN. The column has an unsupported length of 3 m and is braced against side away. The column is reinforced with helical ties. Adopt M 20 grade concrete and Fe 415 HYSD bars. (13)

Or

(b) Design the reinforcement in a short column 400 mm × 400 mm at the corner of a multistorey building to support an axial factored load of 1500 kN together with biaxial moments of 50 kNm acting in perpendicular planes. Adopt M 20 grade concrete and Fe 415 HYSD bars. (13)

15. (a) A 230 mm thick masonry wall is to be provided with a reinforced concrete footing on a site having soil with SBC, unit weight and angle of repose of 125 kN/m², 17.5kN/m³ and 30° respectively. Use M 20 grade of concrete and HYSD steel bars of grade Fe 415. Design the footing when the wall supports at service state, a load of 150 kN/m length. (13)

Or

(b) A rectangular column 600 × 400 mm carries a load of 800 kN. Design a rectangular footing to support the column. The safe hearing capacity of the soil is 200 kN/m². Use M 20 grade concrete. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Explain in detail about the following methods of design.

(i) Elastic method

(ii) Ultimate load method

(iii) Unit State Method.

Also explain their merits and demerits. (15)

Or

(b) Design a footing to carry a strip load of 100 kN/m transferred by a wall of width 0.5 m. Safe bearing capacity of the soil is 150 kN/m². (15)

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80213

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Civil Engineering

CE 6505 — DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write any two advantages of limit state method over elastic method.
2. What is the formula used to find the actual neutral axis in working stress method?
3. On what circumstances doubly reinforced beams are to be adopted?
4. Write any two general features of two way slab?
5. What is the important mechanism of shear resistance in beams with web reinforcement?
6. Define flexural bond and anchorage bond.
7. Write any two reinforcement provision in columns.
8. What is the salient condition for minimum eccentricity of column?
9. Define punching shear.
10. Enumerate proportioning of footings.

PART B — (5 × 16 = 80 marks)

11. (a) Explain the codal recommendations for limit states design? State their significance. (16)

Or

(b) Design a rectangular section for a simply supported reinforced concrete beam of effective span of 4 m carrying a concentrated load of 35 kN at its mid span. The concrete to be used is of grade M 20 and the reinforcement consists of Fe 415 steel bars.

(i) Self weight of beam is ignored.

(ii) Self weight of beam is considered. Use working stress method. (16)

12. (a) Design a T-beam section with a flange width of 1200 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 550 kNm. The concrete mix is to be used is of grade M20 and steel is of grade Fe415. Use limit state method. (16)

Or

(b) Design a slab over a room 5 m × 7m as per I.S. code. The slab is supported on masonry walls all round with adequate restraint and the corners are held down. The live load on the slab is 330 N/m². The slab has a bearing of 150 mm on the supporting walls. (16)

13. (a) Design a shear of rectangular reinforced concrete beam section to carry a factored bending Moment of 220 kNm, factored shear force of 140 kN, and a factored torsional moment of 80 kNm. Use M20 grade concrete and Fe415 steel. (16)

Or

(b) A simply supported RC beam of size 300 × 500mm effective is reinforced with 4 bars of 16 mm diameter HYSD steel of grade Fe415. Determine the anchorage length of the bars at the simply supported end if it is subjected to a factored force of 350 kN at the centre of 300 mm wide masonry support. The concrete mix of grade M20 is to be used. Draw the reinforcement details. (16)

14. (a) Design a column having an effective length of 4.50 m to support a factored load of 1600 kN. Consider the reinforcement ratio p to be in the range 1.5 to 2.0 percent and the effective cover to longitudinal steel of 55 mm. The materials to be used are M25 grade of concrete and HYSD steel bars of grade Fe415. (16)

Or

(b) A braced reinforced concrete column of circular cross-section of 500mm diameter is to support a factored axial load of 2300 kN along with a factored moment of 165 kNm. The unsupported length of the column is 6.3 m with effective length of 5.5m. Design the column when it is to be provided with :

(i) lateral ties and

(ii) spiral reinforcement. The M25 grade of concrete and HYSD steel bars of grade Fe415. (16)

15. (a) A 230 mm thick masonry wall is to be provided with a reinforced concrete footing on a site having soil with SBC, unit weight and angle of repose of 130 kN/m², 17.5 kN/m³ and 30° respectively. The M20 grade of concrete and HYSD steel bars of grade Fe 415. Design the footing when the wall supports at service state: a load of 150 kN/m length. (16)

Or

(b) A Rectangular column 550 × 350 mm carries a load of 775 kN. Design a rectangular footing to support the column. The safe bearing capacity of the soil is 210 kN/m². Use M15 grade concrete. (16)

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PART – B (5×13=65 Marks)

11. a) Design a simply supported reinforced concrete beam to carry a bending moment of 50 kNm as doubly reinforced section by working stress design. Keep the width is equal to half the effective depth. (13)

(OR)

b) Design a simply supported rectangular slab for a hall of size 4 m × 5 m to carry a UDL of 5 kN/m^2. (13)

12. a) Calculate ultimate moment of resistance of the beam of size 300 mm × 500 mm provided with tensile reinforcement of 9000 mm^2 and compression reinforcement of 3000 mm^2. Take the effective cover at top and bottom is 40 mm. (13)

(OR)

b) Design the reinforcement for a T-beam for the following data : (13)

Effective span : 8m

Spacing of beams = 3m, Thickness of slab = 130 mm

Total depth = 450 mm, Live load = 10kN/m^2

13. a) Design the shear reinforcement for a beam 150 mm × 300 mm effective depth subjected to 15 kN/m. the span of the beam is 5 m. Take tensile reinforcement at a section is 1.2%. (13)

(OR)

b) Design the reinforcement required for the section 300 mm × 500 mm for the following data :

Bending moment = 65 kNm, Torsional moment = 40 kNm, Shear force = 70 kN. (13)

14. a) Design a short column to carry an axial load of 1200 kN and moment of 60 kNm about the major axis. The effective height of column is 3 m. (13)

(OR)

b) Design the reinforcement for a column of size 250 mm × 300 mm if it is subjected Pu = 500 kN, Mux = 50 kNm and Muy = 30 kNm. Provide effective cover of 50 mm. (13)

15. a) Design a rectangular footing for a column 400 mm × 400 mm to transfer an axial load of 1000 kN. The safe bearing capacity of soil is 150 kN/m^2. (13)

(OR)

b) Design a combined footing for two columns 300 mm × 300 mm, 4m apart to transfer an axial load of 1500 kN each. The width is restricted to 2.5 m. The safe bearing capacity of soil is 200 kN/m^2. (13)

PART – C (1×15=15 Marks)

16. a) Explain in detail about the following methods of design.

i) Elastic method

ii) Ultimate load method

iii) Unit State Method.

Also explain their merits and demerits.

(OR)

b) Design a footing to carry a strip load of 100 kN/m transferred by a wall of width 0.5 m. Safe bearing capacity of the soil is 150 kN/m^2.

09.11.17 (FN)

Reg. No. :

Question Paper Code : 50287

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fifth Semester
Civil Engineering
CE 6505 – DESIGN OF REINFORCED CONCRETE ELEMENTS
(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Use of IS 456 is Permitted.
Adopt grade of concrete M25 and Fe415 steel wherever required.
Answer ALL questions.

PART – A (10×2=20 Marks)

1. Draw stress strain diagrams for a beam for elastic method, Ultimate Load method and Limit State method (LSD).
2. What are the philosophy of limit state method ?
3. What are the minimum and maximum reinforcement for a beam in LSD ?
4. Distinguish between the behavior of one way slab and two way slab.
5. Determine the anchorage length for 20mm diameter bar.
6. What is torsional shear ?
7. What is the need of minimum eccentricity clause for a column design ?
8. What is meant by braced column ?
9. What are forces to be considered while designing the footing ?
10. When do you prefer combined footing ?

17/12/18

Reg. No. :

Question Paper Code : 20274

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fifth Semester

Civil Engineering

CE 6505 — DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2013)

Time : Three hours Maximum : 100 marks

IS 456 and SP-16 is permitted, Assume any other suitable data if necessary.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the importance of Elastic method over Limit state method?

2. What is the formula used to find the actual neutral axis in working stress method?

3. What is the significance of doubly reinforced section?

4. Write any two advantages of flanged beams.

5. What is the importance of anchorage value of bends?

6. Define shear friction.

7. Write any two salient assumptions are made for the limit state design of columns.

8. What are the important limitations of slender columns?

9. Why the dowel bars are provided in footing?

10. Define punching shear.

PART B — (5 × 13 = 65 marks)

11. (a) A Reinforced concrete rectangular beam is supported on two walls 750 mm thick, spaced at a clear distance of 6.5 m. The beam carries a super imposed load of 30 kN/m. Design the beam in working stress method. Use M20 grade concrete and M.S bars. Draw reinforcement details. (13)

Or

(b) Design one way simply supported slab on a clear span of 4 m, the width of the supports being 300 mm. The dead load on the slab may be taken as 1200 N/m² excluding its self weight. The live load on the slab is 2100 N/m². Use M20 grade concrete and Fe415 grade steel. Adopt working stress method. (13)

12. (a) A T-beam slab floor of an office comprises of a slab 150 mm thick spanning between ribs spaced at 3 m centres. The effective span of the beam is 7.5 m. Live load on floor is 4.0 kN/m². Using M20 grade and Fe415 HYSD bars. Design one of the intermediate Tee beams. Use limit state method. (13)

Or

(b) Design a two way slab for an office floor size 3.3 m × 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/m². Adopt M20 grade and Fe415 HYSD bars. (13)

13. (a) (i) Explain the terms Diagonal tension and bond stress with reference to R.C beams. (5)

(ii) Obtain an expression for calculation of bond stress and shear stress in case of reinforced concrete beams of rectangular section with tensile steel of diameter (ϕ). Also obtain relationship between bond stress and shear stress. (8)

Or

(b) A simply supported RC beam of size 300 × 510 mm effective is reinforced with 4 bars of 16 mm diameter HYSD steel of grade Fe415. Determine the anchorage length of the bars at the simply supported end if it is subjected to a factored force of 350 kN at the centre of 300 mm wide masonry support. The concrete mix of grade M20 is to be used. (13)

14. (a) Design a column having an effective length of 4.50 m to support a factored load of 1580 kN. Consider the reinforcement ratio **p** to be in the range 1.5 to 2.0 percent and the effective cover to longitudinal steel of 55 mm. The materials to be used are M25 grade of concrete and HYSD steel bars of grade Fe415. (13)

Or

(b) Design the reinforcements in a short column 400 mm × 400 mm at the corner of a multistoreyed building to support an axial factored load of 1500 kN, together with biaxial moments of 55 kN.m acting in perpendicular planes. Adopt M20 grade of concrete and steel grade Fe415 HYSD bars. (13)

15. (a) A 230 mm thick masonry wall is to be provided with a reinforced concrete footing on a site having soil with SBC, unit weight and angle of repose of 135 kN/m², 18 kN/m³ and 30° respectively. The M20 grade of concrete and HYSD steel bars of grade Fe415. Design the footing when the wall supports at service state: a load of 150 kN/m length. (13)

Or

(b) Design a combined column footing with a strap beam for two reinforced concrete columns 300 mm × 300 mm size spaced 4m apart and each supporting a factored axial load of 750 kN. Assume the ultimate bearing capacity of soil at site as 230 kN/m². Adopt M20 grade of concrete and steel grade Fe415 HYSD bars. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A reinforced concrete floor slab for a room having inside dimension 4 m × 10 m and supported on all sides by 400 mm thick brick wall. The super imposed load may be taken as 4 kN/m². Adopt M20 grade of concrete and steel grade Fe415 HYSD bars. (15)

Or

(b) Design a column subjected to biaxial bending, $P = 200$ kN, $M_x = 25$ kN.m and $M_y = 15$ kN.m. Adopt M20 grade of concrete and steel grade Fe415 HYSD bars. Take a factor of safety as 1.5. (15)

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23/11/19 / 7M

Reg. No. :

Question Paper Code : 91308

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Civil Engineering

CE 6505 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2013)

(Use of IS 456-2000, is Permitted)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Write any two assumptions are made in elastic theory method.
2. What is the formula used to find the critical neutral axis in working stress method ?
3. Differentiate between under reinforced and over reinforced section.
4. Enumerate balanced section.
5. What is the important mechanism of shear resistance in beams with web reinforcement ?
6. Define flexural bond and anchorage bond.
7. What is the need of minimum eccentricity clause for a column design ?
8. What is meant by braced column ?
9. What is punching shear in RCC footing ?
10. What is one way and two way shear in footing ?

PART – B (5×13=65 Marks)

11. a) Explain the codal recommendations for limit states design.

(OR)

b) Design a rectangular section for a simply supported reinforced concrete beam of effective span of 5 m carrying a concentrated load of 40 kN at its mid span. The concrete to be used is of grade M20 and the reinforcement consists of Fe 415 steel bars.
   i) Self weight of beam is ignored
   ii) Self weight of beam is considered.
   Use working stress method.

12. a) Design a T- beam section with a flange width of 1200 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 550 kNm. The concrete mix is to be used is of grade M20 and steel is of grade Fe415. Use limit state method.

(OR)

b) Design a slab over a room 5m × 7m as per I.S. code. The slab is supported on masonry walls all round with adequate restraint and the corners are held down. The live load on the slab is 330 N/m^2. The slab has a bearing of 150 mm on the supporting walls.

13. a) i) Explain the terms Diagonal tension and bond stress with reference to R.C. beams.
   ii) Obtain an expression for calculation of bond stress and shear stress in case of reinforced concrete beams of rectangular section with tensile steel of diameter (Φ). Also obtain relationship between bond stress and shear stress.

(OR)

b) A beam of rectangular section is reinforced with 6 nos of 18 mm diameter bars in tension and is supported on an effective span of 5 m, the beam being 300 mm wide and 700 mm deep. The beam carries a uniformly distributed load of 42 kN/m. Design the shear reinforcement considering no bars are bent up for shear. Assume σ_{sv} = 230 N/mm^2, τ_c = 0.30 N/mm^2, f_y = 415 N/mm^2.

14. a) Design a short column to carry an axial load of 1200 kN and moment of 60 kNm about the major axis. The effective height of column is 3 m.

(OR)

b) Design the reinforcement for a column of size 250 mm × 300 mm if it is subjected P_u = 500 kN, M_{ux} = 50 kNm and M_{uy} = 30 kNm. Provide effective cover of 50 mm.

15. a) A rectangular RCC column of size 400 mm × 600 mm carrying an axial load of 1800 kN. If the safe bearing capacity of the soil is 150 kN/m^2. Design a suitable footing. Use M20 concrete and Fe415 steel.

(OR)

b) Design a suitable footing for a 500 mm × 500 mm square column transferring 100 kN axial load and a moment of 35 kN/m. The safe bearing capacity of soil is 190 kN/m^2 use M20 concrete and Fe415 steel. Adopt limit state design method.

PART – C (1×15=15 Marks)

16. a) Design a Doubly Reinforced Rectangular simply supported beam at both ends to carry a live load of 25 kN/m and super imposed dead load of 16 kN/m over a clear span of 7 m use M25 and Fe415 are used.

(OR)

b) A RCC section 200 × 400 mm is subjected to a characteristic torsional moment of 2.5 kN/m. and a transverse shear of 60 kN. Assuming the use of M-25 grade concrete and Fe415 HYSD bars. Determine the reinforcement required according to the IS 456 code provisions, using the given data. Assume necessary data if necessary.