9. Previous Year Question Papers

R13

Code No: 115AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2017
REINFORCED CONCRETE STRUCTURES DESIGN AND DRAWING
(Common to CE, CEE)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A
(25 Marks)

1.a) Explain about the different Limit states. [2]
b) Distinguish between Working stress and limit state method of design of RCC structures. [3]
c) Write about local bond and anchorage length. [2]
d) Explain how the shear reinforcement improves the strength of beam? [3]
e) State the differences between one way slab and two way slab. [2]
f) Write the code provisions for minimum reinforcement to be provided as primary and secondary reinforcement in R. C. slab. [3]
g) Differentiate between long and short column. [2]
h) Describe about the function of lateral ties in a RC column. [3]
i) Define punching shear. [2]
j) Write any two situations in which combined footings are preferred to isolated footings. [3]

PART - B
(50 Marks)

2.a) Describe briefly about under-reinforced, balanced and over-reinforced sections.
b) What do you mean by uncracked and cracked sections and how will you determine the moment of resistance of these section? [5+5]

OR

3. Design the reinforcement for a T-beam for the following data:

Effective span	:	9 m: Ends simply supported.
Spacing of beams	:	3.5 m centre to centre.
Thickness of slab	:	125 mm
Width of web	:	230 mm
Total depth	:	450 mm
Live load on the floor	:	5 kN/m^2
Floor finish load	:	1 kN/m^2

The beam also supports a partition wall which transmits a load of 14 kN/m run.
Use M 20 concrete and Fe 500 steel.
Draw a suitable scale: The cross section and the longitudinal section of the beam. [10]

4. A simply supported beam is 8m in span and carries a characteristic load of 50kN/m. If six numbers of 20 mm diameter bars are provided at the mid span and four numbers of these bars are continuous into the supports, check the development length at the supports. Adopt M 20 grade concrete and Fe 415 grade steel. [10]

OR

5. A beam of rectangular section 300 mm width and 450 mm effective depth is subjected to factored moment of 150 kN-m, factored shear force of 45 kN and factored twisting moment of 30kN-m. Determine the area of reinforcement to resist the above forces. Use M25 grade concrete and Fe 415 grade steel. [10]

6.a) Discuss the three basic methods using factor of safety to achieve safe workable structures?

b) Sketch edge and middle strips of a two way slab. [5+5]

OR

7. Design a R.C. slab for a room measuring 6 m × 8 m size. The slab is simply supported on all the four edges with corners held down, and carries a super-imposed load of 3.5 kN/m^2, inclusive of floor finishes. Use M 20 mix and Fe 415 steel. Draw the top plan and bottom plan of the designed slab. [10]

8. Design a reinforced concrete column, 400 mm square, to carry an ultimate load of 1500 kN at an eccentricity of 160 mm. Use M 20 grade concrete and Fe 415 grade steel. [10]

OR

9. Design a slender braced circular column under uni-axial bending with the following data:
Size of column: 300 × 300 mm
Concrete grade: M 20 and Steel grade: Fe 415
Effective length: 5 m and Unsupported length: 6 m
Factored load: 1000 kN ,Factored moment: 50 kN-m at top, 30 kN-m at bottom.
The column is bent in single curvature. [10]

10. Design the footing for a reinforced concrete column 230 × 450 mm carrying an axial load of 1100 KN. The bearing capacity of the soil is 110 KN/m^2. Use M 20 concrete and Fe 415 steel. [10]

OR

11. Draw the shear force and bending moment diagrams and design the 20 mm diameter bars as top steel for maximum hogging moment for a RC rectangular combined footing using the following data:
Centre to centre distance between the columns is 5m. Each column is square in shape with 450 mm side. Each column carries an axial load at service state = 1200kN. The projection of footing parallel to the length beyond the axis of each column is 1.2m. The limiting bearing capacity of soil is 300kN/m^2.Use M25 grade and Fe 415 steel bars. [10]

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R13

Code No: 115AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, November/December - 2016

REINFORCED CONCRETE STRUCTURES DESIGN AND DRAWING

(Common to CE, CEE)

Time: 3 hours Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) What are the assumptions made in the working stress method of design? [2]
b) Explain the salient features of under-reinforced, balanced and over-reinforced sections. [3]
c) What are the different methods of strengthening the RC section to resist shear force? [2]
d) Explain the factors influencing the crack-width in flexural member. [3]
e) Distinguish between the behavior of one-way and two-way slabs. [2]
f) Explain the necessity of corner reinforcement in two-way slabs. [3]
g) Explain the functions of transverse reinforcement in a RC column. [2]
h) Define slenderness ratio of a column and what are its implications? [3]
i) What is the purpose of providing a footing for any structure? [2]
j) Explain the load transfer mechanism in a two-column combined footing. [3]

PART - B

(50 Marks)

2. Design a doubly reinforced concrete simply supported rectangular beam of span 6 m and cross-section 300 mm × 600 mm (Over all depth). The beam is to carry a factored imposed load of 120 kN/m. Use M25 grade of concrete and Fe415 steel. [10]

OR

3. Determine the moment of resistance of a T-beam section with an effective flange width of 1100 mm, width of rib 230 mm and overall depth of the T-beam is 550 mm. The thickness of the slab is 125 mm. The beam is reinforced with 4 bars of 25 mm diameter on tension side. Use M20 grade of concrete and Fe415 steel. [10]

4. Design the reinforcement of a beam section 300 mm × 600 mm subjected to an ultimate twisting moment of 120 kNm and an ultimate shear force of 80 kN. Use M 20 concrete and Fe 415 steel. Sketch the reinforcement details. [10]

OR

5. A simply supported RC beam of effective span 5 m has cross-section 230 mm × 450 mm (overall depth) is reinforced with 3 bars of 20 mm diameter on tension and 2 bars of 12 mm diameter on compression side. The beam is subjected to an imposed working load of 15 kN/m. Determine the short term deflection and long term deflection. Adopt M 20 grade concrete and Fe 415 steel. [10]

6. Design a simply supported RCC slab for a room of clear dimensions 4.2 m × 6.0 m subjected to live load of 3 kN/m^2 and floor finish of 1 kN/m^2. Assume the width of supports is 300 mm. Use M 20 concrete and Fe 415 steel. Draw the reinforcement detailing. [10]

OR

7. Design a continuous reinforced concrete roof slab for a room of 5 m × 14 m. The thickness of the roof is 125 mm and supported by RCC beams of 230 mm wide spaced at 3.5 m c/c. The slab is to carry an imposed load of 3 kN/m^2 and floor finish of 1 kN/m^2. Use M 20 concrete and Fe 415 steel. Also draw the reinforcement detailing. [10]

8. Design an RC column of height 3.6 m and cross-section 400 mm × 400 mm located at the corner of a multi-storied building to support an axial load of 2250 kN together with moments 60 kNm and 45 kNm acting in two perpendicular planes. Use M 25 concrete and Fe 415 steel. [10]

OR

9. Design the reinforcement for a rectangular column 450 mm × 500 mm and effective length 6.6 m, using the following data:
Factored axial load: 1500 kN.
Factored moment about major axis is 60 kNm at top and 45 kNm at bottom
Factored moment about minor axis is 45 kNm at top and 30 kNm at bottom
The column is restrained against sway. Use M 25 concrete and Fe 415 steel. [10]

10. Design an RC square footing for a column of size 400 mm × 400 mm subjected to an axial factored load of 1800 kN. The safe bearing capacity of soil is 200 kN/m^2. Use M 25 concrete and Fe 415 steel. [10]

OR

11. A staircase room has clear dimensions 4 m × 2.5 m and the height between the floors is 3.3 m. Design a suitable dog-legged stair case with mid-landing. Use M 20 grade concrete and Fe 415 steel. Draw the reinforcement detailing in one of the flights. [10]

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Code No: 135AJ **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, September - 2021
DESIGN OF REINFORCED CONCRETE STRUCTURES
(Civil Engineering)

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

Answer any five questions
All questions carry equal marks
- - -

IS456 and design charts for columns (SP-16) are allowed:

1.a) With neat diagrams, derive the stress block parameters from first principles.
b) A simply supported reinforced concrete beam is 250 mm wide and 500mm effective depth and is reinforced with 4 bars of 20 mm diameter as tensile steel. If the beam is subjected to a factored shear of 65 KN at the support. Find the nominal shear stress at the support. Use M20 concrete and Fe 250 steel. [8+7]

2.a) Draw the cross-section of singly reinforced rectangular beam and show the strain and stress diagrams.
b) Discuss the design criteria for single reinforced and doubly reinforced beam sections with neat sketches. [8+7]

3.a) Explain how the longitudinal reinforcement bent up nearer to the supports contribute to the shear resistance of RC beams?
b) Design the shear reinforcement for a simply supported RC beam of effective span 5m with width 300mm and effective depth 400mm and carrying a superimposed load of 10 kN/m. The beam is reinforced with 3 bars of 20 mm diameter. Use M20 concrete and Fe 415 grade steel. [7+8]

4.a) Explain the formulae with figures for the design of shear reinforcements in the following cases : (i) Series of bent-up bars or inclined stirrups at different sections.
(ii) When a single bar or a group of bars are bent-up at the same cross-section.
b) Give neat sketches for the reinforcement details for simply supported and continuous beams with IS code provisions. [8+7]

5.a) Derive the equation of safety for uncracked section of an eccentrically loaded column.
b) Design an axially loaded tied column with an unsupported length of 3 m. The column is fixed at one end and pinned at the other end. The column has to carry a factored load of 2000 kN. Use M 25 Grade Concrete and Fe 415 grade steel. [7+8]

6.a) Explain the construction and use of interaction curves for uniaxial and biaxial Bending in columns
b) Design a circular column of diameter 300mm to carry a factored axial load of 800 kN by using helical reinforcement. Use M20 Concrete and Fe415 steel. [7+8]

7.a) Explain how the one way and two-way shear is being handled in the design of footing with suitable IS code provisions and neat sketches.

b) Design an isolated footing for a column of size 300mm × 600mm carrying a factored axial load of 2500 kN Assume a safe bearing capacity = 350 kN/m^2, M20 grade concrete and Fe 415 grade steel. [8+7]

8.a) Write the IS codal provisions made for calculation and measurement of deflections and cracking in RCC beams.

b) A rectangular section beam with dimensions 200 mm × 450 mm (overall depth) is reinforced with 3 bars of 16 mm diameter at an effective depth of 420 mm. Two hanger bars of 12 mm diameter are provided near the compression face. The effective span of the beam is 5 m and it supports a service load of 10 kN /m. Compute the short-term deflection according to IS: 456-2000 code specifications. Adopt limit state method of design. Take f_{ck} = 20 MPa and f_y = 415 MPa. [7+8]

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Code No: 135AJ **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, October - 2020
DESIGN OF REINFORCED CONCRETE STRUCTURES
(Common to CE, CEE)

Time: 2 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1. Design the reinforcement of a concrete beam section subjected to a moment of 250 kNm. The overall size of the section is limited to 300 mm × 450 mm. Use M 25 concrete and Fe 415 steel reinforcement. Adopt limit state method of design. [15]

2. Explain about stress block parameters. [15]

3. A simply supported RC beam of section 300 mm × 500 mm (effective depth) is subjected to an ultimate shear force of 150 kN at the supports. The beam is reinforced with 4 bars of 20 mm diameter. Design the shear reinforcement. Sketch the shear reinforcement details. Use M 20 concrete and Fe 415 steel. [15]

4. A rectangular reinforced concrete beam of size 300 mm × 600 mm overall depth is subjected to an ultimate moment of 75 kNm, a factored shear force of 90 kN and a factored torsional moment of 25 kNm. Design the longitudinal and transverse reinforcement. Sketch the reinforcement details. Use M 20 concrete and Fe 415 steel. [15]

5. Design a reinforced concrete column of effective length 3.6 m subjected to a factored axial load of 1250 kN and factored moments of 160 kNm and 125 kNm with respect to the major and minor centroidal axes respectively. Use M 25 grade concrete and Fe 415 steel. [15]

6. Design the reinforcement of an RCC column of size 300 mm × 350 mm subjected to a factored axial load of 1200 kN and factored moments of 40 kNm and 25 kNm with respect to the major and minor centroidal axes respectively at the top. The moments at the bottom end equal to 60 % of the corresponding values at the top. Assume the column is bent in double curvature and the effective length of the column is 6.0 m. Use M 25 grade concrete and Fe 415 steel. [15]

7. Design the footing for a rectangular column 300 mm × 450 mm subjected to an axial load of 900 kN. Assume the bearing capacity of soil is 180 kN/m^2. Use M 20 concrete and Fe 415 steel. [15]

8. Design an RCC two-way slab of clear dimensions 4.5 m × 6 m with two adjacent edges continuous. The slab is subjected to live load of 3 kN/m^2 and floor finish of 1 kN/m^2. Assume the width of the supports is 300 mm. Use M 20 grade concrete and Fe 415 steel. Sketch the reinforcement details. [15]

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R16

Code No: 135AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, November/December - 2018
DESIGN OF REINFORCED CONCRETE STRUCTURES
(Common to CE, CEE)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) Distinguish between singly reinforced and doubly reinforced beams. [2]
b) Distinguish between balanced section, under reinforced section and over reinforced section. [3]
c) List the various shear failures of beams. [2]
d) Define bond stress and anchorage. [3]
e) Distinguish between circular columns with helical steel and circular columns with hoop steel. [2]
f) List the uses of Pu-Mu charts in the design of columns. [3]
g) Tell how will you decide the size of footing? [2]
h) Differentiate between isolated and combined tooling. [3]
i) Distinguish between one way slab and two way slab. [2]
j) Describe briefly about torsion reinforcement in slabs. [3]

PART – B

(50 Marks)

2. Describe stress block as per limit state method? Derive stress block parameters from the first principles. [10]

OR

3.a) A doubly reinforced section is 250mm wide and 500mm deep to the centre of tensile reinforcement. It is reinforced with 2bars of 16mm diameter as compression reinforcement at an effective cover of 50mm and 4bars of 25mm diameter as tensile reinforcement. Calculate the ultimate moment of resistance of the beam section.
b) Find the area of steel and moment of resistance for the given data of a T-Beam when M20 Concrete and Fe415 grade steel are used. Flange width: 1200mm, Flange thickness: 80mm, effective depth: 500mm, rib width: 250mm. Consider the section as balanced section. [10]

4. A R.C Beam 300mm × 450mm is reinforced with 3bars of 20 mm diameter with an effective cover of 50mm in tension zone. The ultimate shear at the section is 210kN. Design the shear reinforcement. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. [10]

OR

5. List the steps involved in the design of CANOPY. [10]

6. An R C rectangular column of size 250mm × 300mm is reinforced with 4 bars of 20mm ϕ provided one at each corner with an effective cover of 60mm. Examine the safety of the column if it is subjected to P_u=300kN. M_{ux}=30kNm, M_{uy}=20kNm. Assume M20 concrete and Fe415 grade steel. [10]

OR

7. Design a short helically reinforced column of unsupported length 3.6m to carry an axial service load of 1200kN. Use M25 concrete and Fe415 steel. Sketch the reinforcement details. [10]

8. Design an isolated square footing for a column of size 300 mm × 300 mm carrying a factored axial load of 800kN. Safe bearing capacity of the soil is 100kN/m^2. Use M25 Concrete and Fe415 grade steel. [10]

OR

9. Design an isolated circular footing for a column of size 300 mm diameters carrying a factored axial load of 700kN. Safe bearing capacity of the soil is 100kN/m^2. Use M20 Concrete and Fe415 grade steel. [10]

10. Design a slab for room of size 5m × 6m supported on 300mm thick masonry walls all around. The corners are held down. The Live load is 2.5kN/m^2. Use M20 concrete and Fe415 steel. [10]

OR

11. Design a stair case for an office building to be located in a room measuring 3.5m×5.5m. The vertical distance between floors is 3.8m. The Live load can be assumed as 4kN/m^2. Use M20 concrete and Fe415 steel. Take Rise as 150mm and Tread as 300mm. [10]

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Code No: 135AJ **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, May/June - 2019
DESIGN OF REINFORCED CONCRETE STRUCTURES
(Common to CE, CEE)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) What is the advantage of a T-beam design concept? [2]
b) Explain the various limit states. [3]
c) What is the significance of development length in RCC members? [2]
d) What are the parameters influencing the design shear strength of concrete? [3]
e) What are the advantages of helically reinforced columns? [2]
f) Explain the modes of failure of RCC short and long columns. [3]
g) What is the necessity of a combined footing? [2]
h) Distinguish between one-way shear and two-way shear. [3]
i) What is the need of limiting the deflection of various structural members? [2]
j) What is the importance of calculation of crack width and list out the parameters Influencing the crack width of beams. [3]

PART - B

(50 Marks)

2.a) Derive an expression for the moment of resistance of a rectangular section '$B \times d$'. Assume M 20 grade concrete and Fe 415 grade steel reinforcement. Use limit state method of design.
b) A reinforced concrete simply supported rectangular beam of effective span 5 m and size 230 mm × 450 mm effective depth is reinforced with 4 bars of 16 mm diameter. Determine the safe uniformly distributed load the beam can resist in addition to its self-weight. Use M 25 concrete and Fe 415 steel. Adopt limit state method of design. [4+6]

OR

3. A reinforced concrete slab of thickness 125 mm is supported by simply supported beams of span 4.8 m and overall size 230 mm × 400 mm. The beams are spaced at 3.6 m c/c and reinforced with 4 bars of 20 mm diameter. Determine the moment of resistance of the T-beam section. Use M 20 concrete and Fe 415 steel. Adopt limit state method of design. [10]

4. A rectangular reinforced concrete beam of size 300 mm × 500 mm, overall depth, is subjected to an ultimate moment of 150 kNm, a factored shear force of 100 kN and a factored torsional moment of 50 kNm. Design the beam and sketch the reinforcement details. Use M 25 concrete and Fe 415 steel. [10]

OR

5. A two span continuous beam with simple supports, each span of 6 m, is subjected to a characteristic dead load of 25 kN/m and characteristic live load of 40 kN/m. Design the beam and draw the reinforcement details. [10]

6. Design the reinforcement for a column of section 350 mm × 350 mm, subjected to a factored axial load of 1200 kN and a factored moment of 150 kNm. Use M 25 grade concrete and Fe 415 steel. The effective length of the column is 3.6 m. [10]

OR

7. Design the reinforcement of a column of size 350 mm × 400 mm subjected to a factored axial load of 1600 kN and factored moments of 50 kNm and 40 kNm with respect to the major and minor centroidal axes respectively at the top. The moments at the bottom end equal to 75 % of the corresponding values at the top. Assume the column is bent in double curvature and the effective length of the column is 6.6 m. Use M 25 grade concrete and Fe 415 steel. [10]

8. Design the circular footing for a column of 450 mm diameter carrying an axial load of 900 kN. The effective length of the column is 4.5 m. Assume the bearing capacity of soil is 200 kN/m^2. Use M 20 concrete and Fe 415 steel. [10]

OR

9. Design a combined footing for two columns, 400 mm × 400 mm supporting an axial load of 900 kN and 500 mm × 500 mm supporting an axial load of 1200 kN. These two columns are 5 m apart. The safe bearing capacity of the soil is 180 kN/m^2. Use M 25 concrete and Fe 415 steel. [10]

10. Design an RCC slab of clear dimensions 4 m × 5 m with all four edges continuous. The slab is subjected to live load of 4 kN/m^2 and floor finish of 1 kN/m^2. Assume the width of the supports is 300 mm. Use M 25 grade concrete and Fe 415 steel. Sketch the reinforcement details. [10]

OR

11. A simply supported reinforced concrete beam of effective span 6 m has cross-section 230 mm × 500 mm overall depth is reinforced with 4 bars of 16 mm diameter in tension and 2 bars of 12 mm diameter in compression. The beam is subjected to a superimposed working load of 30 kN/m. Determine the short term and long term deflections. Adopt M 25 grade concrete and Fe 415 steel. [10]

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R16

Code No: 135AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2021
DESIGN OF REINFORCED CONCRETE STRUCTURES
(Common to CE, CEE)

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

Answer any five questions
All questions carry equal marks

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Note: Use of only IS 456:2000 is allowed:

1.a) Distinguish between balanced, under reinforced and over reinforced sections with neat sketches as per limit state method.
b) Obtain the stress block parameters from first principles as per limit state method. [7+8]

2. Design a simply supported T-beam for the given data. Span: 6m, Spacing of beams: 2.5m, slab thickness:120mm and Live load: 4kN/m^2. Use M25 concrete and Fe415 steel. Sketch the reinforcement details. [15]

3. Design a cantilever beam of 400mm deep and 350mm wide subjected to a point load of 2kN at 3 mm from free end and U.D.L of 1kN/m over entire span of 6m. Check for shear and deflection. Use M20 mix and Fe 500 grade steel. [15]

4. Find the reinforcement required for a rectangular beam section with the following data: Width of section = 300 mm, depth of section = 535 mm, factored B.M = 80 kN-m, factored torsional moment = 40 kN-m, factored S.F. = 70 kN. Adopt M 20 grade of concrete and Fe 500 grade of steel. [15]

5. Design an isolated circular footing for a column of size 400 mm diameters carrying a factored axial load of 900kN. Safe bearing capacity of the soil is 120kN/m^2. Use M25 Concrete and Fe500 grade steel. Sketch the reinforcement details. [15]

6. Design a circular column of diameter 300mm to carry a factored axial load of 1500kN by using (a) helical reinforcement, (b) hoop reinforcement. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. [7+8]

7. Design a slab for room of size 4 m × 5 m supported on 300 mm thick masonry walls all around. The corners are free to lift. The Live load is 2.5 kN/m^2. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. [15]

8. A flight of stairs to be provided in an office building is to be supported by a stinger beam on one edge and a brick wall on the other. The effective horizontal span of stairs may be taken as 1.5m. The risers are 150mm and the treads are 270mm. Design the steps allowing a L.L of 3 kN/m^2. Use M20 concrete and Fe415 steel. [15]

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Code No: 135AJ **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, January/February - 2023
DESIGN OF REINFORCED CONCRETE STRUCTURES
(Civil Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.
iv) **Use of only IS 456 is allowed.**

PART – A

(25 Marks)

1.a) What is meant by 'Transformed section' as used in 'Reinforced Sections'? [2]
b) What is meant by 'balanced section' as per Working Stress method and Limit state method? [3]
c) Explain the difference between 'flexural bond' and 'development bond'. [2]
d) What is meant by 'equilibrium torsion'? [3]
e) Distinguish between 'unsupported length' and 'effective length' of a column. [2]
f) What are the functions of a lateral ties in the columns? [3]
g) When do the eccentric loadings occur on a footing? [2]
h) Explain the situations in which the combined footings are preferred to isolated footings. [3]
i) What is the difference in behavior between one-way slab and two-way slab? [2]
j) What is the basic difference in structural behavior between 'stair slabs spanning transversely' and 'stair slabs spanning longitudinally'? [3]

PART – B

(50 Marks)

2. Design and flexural reinforcement for an RC beam of size 300 mm wide and 500 mm deep to resist an ultimate moment of 460 kNm. Assume moderate exposure condition. Use M 30 concrete and Fe 500 grade steel. Adopt Limit State method. Sketch the reinforcement details. [10]

OR

3. A hall of internal dimensions 6 m × 18 m has beams spaced at 3 m c/c and a slab of 150 mm thick. The beams are supported by 300 mm thick walls. The super imposed load on the slab is 4 kN / m^2. Design an intermediate T – beam for flexure and shear completely. Assume moderate exposure condition. Use M 25 grade concrete and Fe 500 grade steel. Adopt Limit State method. Sketch the reinforcement details. [10]

4. Design the torsional reinforcement in a rectangular beam section 350 mm wide and 750 mm deep, subjected to an ultimate twisting moment of 160 kNm, an ultimate hogging bending moment of 250 kNm and an ultimate shear force of 180 kNm. Use M30 concrete and Fe 500 grade steel. Assume moderate exposure condition. Sketch the reinforcement details. [10]

OR

5.a) What are the mechanisms by which bond resistance is developed in reinforced concrete?

b) For a reinforced concrete tension member, a 20mm diameter rebar has to be lap spliced with a 25mm diameter rebar. Use M 25 concrete and Fe 500 grade steel. Design a suitable splice. [3+7]

6. Design an axially loaded rectangular column with an unsupported length of 4.3 m. The column is fixed at one end and pinned at the other end. The column has to carry a factored load of 2700 kN. Use M 30 grade concrete and Fe 500 grade steel. Sketch the reinforcement details. Assume moderate exposure condition. Sketch the reinforcement details. [10]

OR

7. A column 300 mm × 400 mm has an effective length of 3.6 m. It is subjected to an ultimate load of 1500 kN and an ultimate moment of 260 kNm about its major axis. Determine the longitudinal and transverse reinforcement. Use M40 concrete and Fe 500 grade steel. Assume moderate exposure condition. Sketch the cross-section showing reinforcement details. [10]

8. Design a rectangular isolated stepped footing for a column of size 350 mm × 650 mm carrying an axial load of 2800 kN. The S.B.C. of the soil is 350 kN / m^2. Use M 30 grade concrete and Fe 500 grade steel. Assume severe exposure condition. [10]

OR

9. Design an isolated circular footing for a reinforced concrete circular column 600 mm diameter, subjected to a factored axial load of 1600 kN. The column is reinforced with 8 reinforcing bars of 20 mm diameter. The safe bearing capacity of the soil is 300 kN/m^2 at a depth of 1.5 m. Assume M35 grade concrete and Fe 500 grade steel. Sketch the reinforcement details. [10]

10. Design a R.C. slab for a room measuring 4 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 30 grade concrete and Fe 500 grade steel. Sketch the reinforcement details. Assume mild exposure condition. [10]

OR

11. A simply supported one-way slab 150 mm thick having an effective span of 4.5 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 3 kN/m^2 and a surface finish of 1 kN/m^2. Use M25 concrete and Fe 500 grade steel. Assume ultimate shrinkage strain = 0.0003 and creep coefficient = 1.6. Estimate the only the long-term deflection. [10]

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Code No: 135AJ **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, February - 2022
DESIGN OF REINFORCED CONCRETE STRUCTURES
(Civil Engineering)

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

Answer any five questions
All questions carry equal marks
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Note: IS 456 & only the design charts for columns (SP 16) are allowed:

1.a) Explain the terms balanced, over-reinforced and under-reinforced section in bending. Explain which of these should be recommended in design.
b) A beam simply supported over an effective span of 7m carries alive load of 20 kN/m. Design the beam, using M20 concrete and HYSD bars of grade Fe415.keep the width equal to half the effective depth. Assume unit weight of concrete as 25KN/m^3. Sketch the reinforcement details. [8+7]

2.a) Explain the limiting moment of resistance and give the expression for the Fe 250 and Fe415 grade steel.
b) Design a T-beam whose dimensions are b_f= 700 mm and effective depth = 300 mm, width of web b_w=200 mm, D_f= 100 mm. Applied moment of 350 kNm. Use M20 grade concrete and Fe500 grade steel. Sketch the reinforcement details. [7+8]

3.a) Explain modes of failures in R.C beams with neat sketches.
b) A simply supported beam 300 mm × 600 mm (effective) is reinforced with 5 bars of 25 mm diameter. It carries a uniformly distributed load of 80 kN/m (including its own weight) over an effective span is 6 m. out of 5 main bars can be bent up safely near the supports. Design the shear reinforcement for the beam. Use M20 grade of concrete and Fe415 steel. [7+8]

4.a) Explain IS456 method of design of reinforced concrete members subjected to torsional moment.
b) A reinforced concrete beam of rectangular section with a width of 350 mm and overall depth of 800 mm is subjected to a factored bending moment of 215 kNm, ultimate torsional moment of 105 kNm an ultimate shear force of 150 kN. Using M-25 grade concrete and Fe 500 HYSD bars and side, top and bottom covers of 50 mm, design suitable reinforcement in the section. [7+8]

5.a) Explain the modes of failure of columns.
b) Design a column of unsupported length 3m to carry an axial load of 2000 kN and a BM of 150kNm at service conditions. Design the column as a short column. The column is subjected to severe exposure condition and grade of steel is Fe500. Provide equal reinforcement on all the faces. Use M30 concrete. Sketch reinforcement details. [7+8]

6.a) Derive the expression for the ultimate load for axially loaded short column.

b) A braced reinforced concrete column of circular cross-section of 500mm diameter is to support a factored axial load of 2250 kN along with a factored moment of 160 kNm. The unsupported length of the column is 6.3m effective length of 5.5m. Design the column when it is to be provided with: Lateral ties and Spiral reinforcement. The M25 grade of concrete and HYSD steel bars of grade Fe500. [7+8]

7.a) What are the different types of foundations? Explain with figures.

b) Design a rectangular isolated sloped footing for a column of size 250 mm × 750 mm carrying an axial load of 2600 kN. The S.B.C. of the soil is 300 kN/m^2. Use M 25 grade concrete and Fe 500 grade steel. [7+8]

8.a) Sketch the reinforcement detailing of one way and two way slabs.

b) Design a one−way slab, with a clear span of 4.0 m, simply supported on 230 mm thick masonry walls, and subjected to a live load of 4 kN/m^2 and a surface finish of 1 kN/m^2. Assume Fe 500 steel. Assume the beam is subjected to moderate exposure conditions. [7+8]

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Code No: 135AJ **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, August - 2022
DESIGN OF REINFORCED CONCRETE STRUCTURES
(Civil Engineering)

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

Answer any five questions
All questions carry equal marks
- - -

Note: Use of IS 456:2000 and only *design charts* of SP16 is allowed.

1.a) Derive the 'stress block' parameters from first principles.
b) Calculate the 'balanced percentage of steel' for M30 concrete and Fe 500 grade steel from first principles, as per Limit State Design. [8+7]

2. Design and flexural reinforcement for an RC beam of size 300 mm wide and 450 mm deep to resist an ultimate moment of 400 kNm. Assume moderate exposure condition. Use M25 concrete and Fe 500 grade steel. Adopt Limit State method. Sketch the reinforcement details. [15]

3.a) With a neat sketch, explain the force components that participate in the shear transfer mechanism at a flexural-shear crack location in a reinforced concrete beam.
b) A simply supported beam of 6.3 m effective span, is to carry a uniformly distributed load (dead load) of 20 kN/m including its self-weight, and a live load of 30 kN/m. Design the beam for shear using Limit state method. Use M25 concrete and Fe 500 grade steel. Sketch the reinforcement details. [6+9]

4.a) List the main factors that influence bond strength of a reinforcing bar.
b) Design the torsional reinforcement in a rectangular beam section 350 mm wide and 800 mm deep, subjected to an ultimate twisting moment of 180 kNm, an ultimate hogging bending moment of 300 kNm and an ultimate shear force of 150 kNm. Use M30 concrete and Fe 415 grade steel. Assume moderate exposure condition. Sketch the reinforcement details. [3+12]

5.a) What are the functions of transverse reinforcement in reinforced concrete column.
b) A column 360 mm × 450 mm has an effective length of 3.4 m. It is subjected to an ultimate load of 1400 kN and an ultimate moment of 300 kNm about its major axis. Determine the longitudinal and transverse reinforcement. Use M30 concrete and Fe 415 grade steel. Assume moderate exposure condition. Sketch the cross-section showing reinforcement details. [3+12]

6.a) Derive the expression, from first principles, for 'Ultimate Load Carrying Capacity' of an axially loaded short RC column with lateral ties.
b) Design longitudinal reinforcement and ties if an axially loaded column subjected to a working load of 1000 kN. The unsupported length of the column is 3.5 m. Use M25 concrete and Fe 500 grade steel. Sketch the cross-section showing reinforcement details. [5+10]

7. Design an isolated rectangular footing for a reinforced concrete column 300 mm × 550 mm reinforced with 6 reinforcing bars of 25 mm diameter, subjected to a factored axial load of 1200 kN and a factored uniaxial moment (about major axis), of 150 kNm at the column base. The safe bearing capacity of the soil is 220 kN/m^2 at a depth of 1.5 m. Assume M25 concrete and Fe415 grade steel. Sketch the reinforcement details. [15]

8. A simply supported one-way slab 180 mm thick having an effective span of 4.5 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 3 kN/m^2 and a surface finish of 1 kN/m^2. Use M25 concrete and Fe 500 grade steel. Assume ultimate shrinkage strain = 0.0003 and creep coefficient = 1.6. Estimate the only the long-term deflection. [15]

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