

B.Tech III Year I Semester (R20) Regular & Supplementary Examinations January 2024
DESIGN OF REINFORCED CONCRETE STRUCTURES
 (Civil Engineering)

Time: 3 hours

Max. Marks: 70

Use of IS 456:2000 & relevant sheets (pertaining to columns) of SP16 code books are permitted.
 Assume any missing data.

PART – A**(Answer any one question: 01 X 28 = 28 Marks)**

- 1 (a) Design a rectangular R.C simply supported beam carrying a live load of 15 kN/m and dead load of 8 kN/m. The effective span of the beam is 6 m. Use the M25 and Fe500 combination. The width of the support is 300 mm. Show the complete detailing of reinforcement. 14M
 - (b) Design a simply supported RCC slab for a roof of a hall 4 m x 10 m width 250 mm thickness wall all around. Assume a live load of 5kN/m² and a floor finish of 1kN/m². Use M20 and Fe415 grades. Show the detailing of reinforcement clearly. 14M
- OR**
- 2 (a) Design the longitudinal reinforcement for a braced column, 300 mm x 450 mm, subjected to a factored axial load of 1800kN, $M_{ux} = 80$ kNm and $M_{uy} = 60$ kNm at top and bottom moments are equal to 50% of top moments. Assume the column is bent in both directions. The effective length of the column is 6 m. Use M25 and Fe500 grade concrete and steel. 14M
 - (b) Design a rectangular footing of uniform thickness for a R.C column bearing a vertical load of 1000 kN and having a base size of 400 x 600 mm. The Safe bearing capacity of soil is 150 kN/m². Use M20 and Fe415 grades. Show the detailing of reinforcement. 14M

PART – B**(Answer any three questions: 03 X 14 = 42 Marks)**

- 3 (a) A reinforced concrete beam has width equal to 300 mm and overall depth 700 mm with a cover of 40 mm to the centre of the reinforcement. Design the beam if it is subjected to a bending moment of 150 kNm. Use M20 and Fe415 grade of concrete and steel. 7M
- (b) Design a doubly reinforced concrete beam of rectangular section whose effective span is 5 m. It is subjected to a (LL+DL) of 40 kN/m. Assume the size of the beam as 250 x 500 mm. Use M20 and Fe415. 7M
- 4 (a) Find the reinforcement required for a rectangular beam section 300 x 600 mm subjected to a factored moment of 115 kNm, factored torsion 45 kNm and Factored shear of 95 kNm. Use M20 and Fe415. 7M
- (b) A Simply supported beam 8 m span is reinforced with 6 bars of 25 mm diameter at centre of span and 50 percent of the bars are continued into support. Check the development length at supports and a characteristic total load of 50 kN/m.
- 5 (a) Design an axially loaded tied column 400 mm x 400 mm pinned at both ends with an unsupported length of 3.2 m to carry a factored load of 2500 kN. Use M25 and Fe500 grade concrete and steel. 7M
- (b) Design a tied circular column of 500 mm diameter to carry a factored load of 800 kN and Factored moment 162.5 kNm. Use M20 and Fe415 grades. 7M
- 6 (a) Write down the step-by-step procedure involved in the design of circular footing. 7M
- (b) Design the size and main reinforcement alone for an isolated footing of uniform thickness of a R.C column bearing a vertical load of 600 kN and a base of 450 mm x 450 mm. The Safe bearing capacity of soil may be taken as 120 kN/m². Use M25 and Fe500 Steel.
- 7 (a) A hall has clear dimensions 3 x 9 m with wall thickness 230 mm. The live load on the slab is 3kN/m² and floor finish of 1 kN/m². Use M20 and Fe415 grade of concrete and steel. Design the slab 7M
- (b) Design a dog-legged stair for a building in which the vertical distance between the floor is 3.6m. The stair hall measures 2.5 m x 5 m. The live load may be taken as 2.5 kN/m². Use M25 concrete and Fe500 steel. 7M

B.Tech III Year I Semester (R20) Supplementary Examinations August 2023
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PART – A**(Answer any one question: 01 X 28 = 28 Marks)**

- 1 Design a RC floor for slab a room 4.5 m x 7 m in size to support a super imposed load of 28M
 5 kN/m². The edges of the slab are freely supported and its corners are held down. Draw plan
 and sectional elevations in detail.

OR

- 2 Design a square footing for a square column 450 mm x 450 mm, reinforced with 6-25 Φ bars, 28M
 and carrying a service load of 1250 kN. Assume soil with an allowable pressure of 230 kN/m² at
 a depth of 1.5 m below ground. Assume Fe415 grade steel and M25 for both column and
 footing. Draw plan and sectional elevations in detail.

PART – B**(Answer any three questions: 03 X 14 = 42 Marks)**

- 3 A reinforcement concrete cross section of 200 mm width and 400 mm effective depth is provided 14M
 with 4 numbers of 20 mm bars in tension zone and 3 numbers of 20 mm bars in the compression
 zone at depth 50 mm from the compression fiber. Determine whether the cross-section is
 capable of resisting limit moment.
- 4 Design a rectangular slab 5 m by 4 m in size and simply supported at the edges to support a 14M
 service load of 4 kN/m². Assume coefficient of orthotropy (μ) as 0.7. Adopt M-20 grade concrete
 and Fe-415 HYSD bars.
- 5 Design the reinforcements in a circular column of diameter 300 mm to support a service axial 14M
 load of 800 kN. The column has unsupported length of 3 m and is braced against side sway. The
 column is reinforced with helical ties. Adopt M-20 grade concrete and Fe-415 HYSD steel.
- 6 Design the reinforcement in a column of size 400 mm x 600 mm, subjected to a factored axial 14M
 load of 2500 kN. The column has unsupported lengths of 3.0 m and is braced against side way
 in both directions. Use M 20 concrete and Fe 415 steel.
- 7 Design one of the flights of dog-legged stairs spanning between landing beams using the 14M
 following data: Number of steps in the flight = 10, Tread (T) = 300 mm, rise (R) = 150 mm Width
 of landing beams = 300 mm, M-20 grade concrete and Fe-415 HYSD bars.
