

BACHELOR OF ARCHITECTURE (B.Arch.)

Term-End Examination

June, 2016

BAR-044 : THEORY OF STRUCTURES – V

Time : 3 hours

Maximum Marks : 70

Note : Answer any four questions. All questions carry equal marks. Use of calculator and IS : 456 code is allowed.

1. Design a cantilever beam of span 3.5 m and of uniform width 300 mm. The beam carries UDL of 30 kN/m including its self weight. Adopt Fe 415 grade of steel and M-20 grade of concrete. Assume width of support as 300 mm.

$17\frac{1}{2}$

2. Design a shear reinforcement for an RCC beam of effective span 6 m. The beam carries UDL of 25 kN/m as Imposed load. Effective depth of the beam is 550 mm and width is 300 mm and is reinforced with 4 bars of 25 mm ϕ . Adopt M-20 grade of concrete and Fe 415 grade of steel.

$17\frac{1}{2}$

3. Design a two way RC slab for an office floor of effective size $3.5 \text{ m} \times 4.5 \text{ m}$, simply supported on all its four edges with corners free to lift. Live load on the slab is 5 kN/m^2 . Use M-20 grade of concrete and Fe 415 grade of steel. $17\frac{1}{2}$

4. A column of unsupported length 3.0 m has a cross-section of $450 \times 600 \text{ mm}$. The column is subjected to factored axial load of 4000 kN and both ends are effectively held in position and restrained against rotation. Use Fe 415 grade of steel and M-40 grade of concrete. $17\frac{1}{2}$

5. An RC column $450 \text{ mm} \times 600 \text{ mm}$ has to transmit a factored load of 2600 kN to the footing. Design the footing, if safe bearing capacity of the soil is 250 kN/m^2 . Adopt M-25 grade of concrete and Fe 415 grade of steel. $17\frac{1}{2}$

6. Calculate the moment of resistance of doubly RC beam with following details :

Effective depth = 550 mm , width = 300 mm , top cover = 20 mm , top reinforcement = 2 bars of $16 \text{ mm}\phi$, Bottom reinforcement = 3 bars of $20 \text{ mm}\phi$, Grade of concrete = M-20 and Grade of steel = Fe 415. Assume, f_{sc} the compressive stress in steel = $0.7 f_y$. $17\frac{1}{2}$

7. Answer the following :

- (a) Why does the code impose maximum and minimum limits with regards to spacing and percentage area of flexural reinforcement? 6
- (b) What is the necessity of Earthquake Resistant Structures? 6
- (c) Discuss the need of doubly reinforced beams. $5\frac{1}{2}$
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