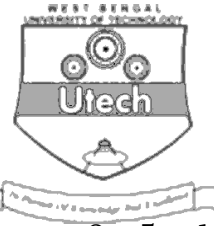


- iv) Total maximum deflection in reinforced concrete beam of span 6 m should not be greater than
- a) 24 mm b) 30 mm
- c) 50 mm d) none of these.
- v) Uniformly distributed live load on stairs of dwelling houses is generally taken as
- a) 1 kN/m^2 b) 2 kN/m^2
- c) 3 kN/m^2 d) 4 kN/m^2 .
- vi) The modular ratio m in terms of permissible compressive stress due to bending in concrete σ_{cbc} (in N/mm^2) is given by
- a) $280 / \sigma_{cbc}$ b) $2800 / \sigma_{cbc}$
- c) $280 / 3 \sigma_{cbc}$ d) $2800 / 3 \sigma_{cbc}$.
- vii) Modulus of rupture of concrete is a measure of
- a) flexural tensile strength
- b) direct tensile strength
- c) compressive strength
- d) split tensile strength.
- viii) Maximum percentage reinforcement in case of slab is limited to
- a) 2 b) 4
- c) 6 d) 8.

- [Turn over



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. Explain the terms 'balanced', 'over-reinforced' and 'under-reinforced' section in bending. Which section is generally recommended in design ?
3. Calculate the ultimate moment of resistance of T-beam having the following section properties :

Width of flange = 1000 mm, effective depth = 500 mm, thickness of the flange = 100 mm, steel = 4 nos. 20 mm dia. width of the rib = 250 mm. Use M-20 & Fe-415.
4. A simply supported beam is 6 m is span and carries a characteristic load of 60 kN/m. If the 6 nos. of 20 mm bars are provided at the centre of the span and 4 nos. of these are continued into the supports. Check the development at the supports assuming grade 15 concrete and Fe-415 steel.
5. An R.C.C. column of 5 m effective length has diameter of 500 mm is reinforced with 8 mm-20 mm ϕ bars. The column carries lateral ties of 10 mm ϕ bar wound around. 20 mm ϕ bars at a pitch of 60 mm. The cover to the outside of 20 mm ϕ longitudinal bars of column is 40 mm. Use M 20 concrete & Fe 250 steel. Find the load carried by the column.
6. Distinguish between one way and two way slabs.

[Assume any suitable data not provided]

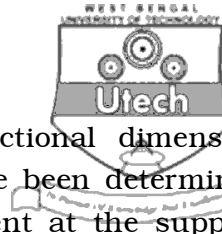


GROUP – C

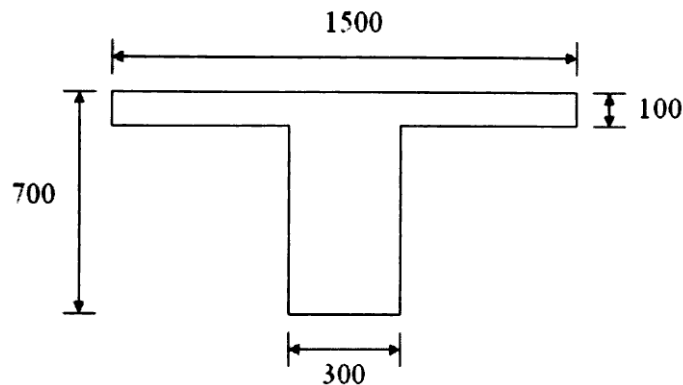
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. Design and isolated square footing of uniform thickness. The load coming to footing through a column of size $450 \text{ mm} \times 450 \text{ mm}$ is 750 kN . The safe bearing capacity of soil may be taken as 125 kN/m^2 . Use M 25 concrete and Fe 415 steel.
8. The drawing room of a residential building is measured $4.0 \text{ m} \times 6.5 \text{ m}$. The floor slab is assumed to be simply supported on 250 mm wall on all the four edges. Design the building slab by using grade of concrete M20 and grade of steel Fe 415.
9. a) Determine the longitudinal steel required for a column of size $450 \text{ mm} \times 600 \text{ mm}$. Carrying $P_u = 1650 \text{ kN}$, factored M (major axis) = 125 kN-m and factored.
 M (minor-axis) = 100 kN-m . Assume, $f_{ck} = 15 \text{ N/mm}^2$, $f_y = 415 \text{ N/mm}^2$; $d' = 60 \text{ mm}$.
b) A cantilever canopy is made up of monolithically beam of 8 m span with a cantilever slab of 4 m . The beam section is 400 mm wide by 1200 mm deep. The live load on slab is 1.5 kN/m^2 . Determine the torsion and shear due to live load for which the beam should be designed.



10. A continuous T-beam has the cross-sectional dimension shown in figure. The web dimension have been determined from the consideration of negative moment at the support and shear strength requirements. The span is 10 m and the design moment at mid-span under factored loads is 800 kNm. Determine the flexural reinforcement requirement at mid-span. Consider Fe 415 steel. Assume that the beam is subjected to moderate exposure condition.



3 + 7 + 5

11. A dog-legged staircase is to be designed for intermediate floor of a multistoried residential building, within a stair hall having clear dimensions 5.4 m × 2.5 m. The stair hall has 4 columns at its 4 corners measuring 250 mm × 400 mm each and beams at longitudinal ends of the flight measuring 250 mm × 350 mm each. Take
- Floor to floor height of the building = 3.3 m,
 - Intensity of live load = 2.5 kN/m^2 of plan area,
 - Rise of steps is 150 mm,
 - Width of landing = width of flight = 1200 mm.

Show general arrangement of the staircase and design and detail both the flights of the stair. Assume maximum comfort to the users, M20 concrete and Fe 415 grade of steel.



12. Design a reinforced concrete beam with neat sketch of reinforcement of a rectangular section using the following data :

Effective span = 8 m,

Working live load = 30 kN/m

Breadth of the beam = 300 mm

Depth of beam (overall) = 650 mm

Grade of concrete M20

Grade of steel = Fe 415

Effective cover of beam = 50 mm.

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