

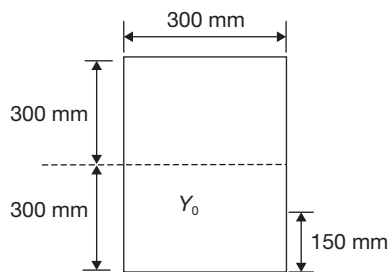
TEST

Concrete Structures

Time: 60 Minutes

- The following two statements are made with reference to a simply supported under reinforced RCC beam.
 - Steel reaches ultimate stress prior to concrete reaching ultimate stress.
 - There is a shift in neutral axis upwards as the load is increased.
 - Both the statements are false.
 - I is true but II is false.
 - I is false but II is true.
 - Both statements are true.
- As per the provisions of IS:456–2000, the (short term) modulus of elasticity of M40 grade concrete (in N/mm²) can be assumed to be
 - 31600
 - 28500
 - 30000
 - 36000
- As per IS:456–2000, the effective length of column in a Reinforced concrete building frame is independent of
 - height of column.
 - loads acting on frame.
 - frame type.
 - span of beam.
- Maximum strains in an extreme fiber in concrete and in the tension Reinforcement (Fe250 grade and $E_s = 200$ kN/mm²) in a balanced section at limit state of flexure are respectively
 - 0.0035 and 0.0041
 - 0.002 and 0.0038
 - 0.0035 and 0.0030
 - 0.002 and 0.0018
- An isolated foot bridge has a slab of 4 m width. The central supporting beam is of 8 m length, width of web-350 mm. The effective width of flange is,
 - 1.25 m
 - 1.68 m
 - 1.75 m
 - 2.0 m
- The percentage of minimum shear reinforcement as per IS:456 using HYSD bars of Fe415 grade is
 - 0.11%
 - 0.15%
 - 0.3%
 - 0.2%
- Which of the following is the correct expression to estimate the development length of deformed reinforced bars used in compression as per IS:456 in limit state of design?
 - $\frac{\phi \sigma_s}{8 \tau_{bd}}$
 - $\frac{\phi \sigma_s}{4 \tau_{bd}}$
 - $\frac{\phi \sigma_s}{64 \tau_{bd}}$
 - $\frac{\phi \sigma_s}{5 \tau_{bd}}$
- What is the value of minimum percentage of reinforcement in case of Fe250 steel in slabs?
 - 0.1%
 - 0.12%
 - 0.2%
 - 0.15%
- Minimum grades of concrete to be used for pre tensioned and post tensioned structural elements are respectively [As per IS:1343–1980]
 - M30 and M40
 - M40 and M30
 - M20 and M30
 - M30 and M30
- Which of the following are subjected to primary torsion?
 - Isolated L-beam
 - Ringbeam of circular water tank
 - A and B
 - Grid system
- A singly reinforced rectangular section of 300 mm wide and 550 mm effective depth, reinforced with 3 bars of 16 mm diameter Fe415 steel bars. The concrete used is M20 grade. The ultimate moment of resistance of beam is _____ (in kN-m)
 - 110
 - 150
 - 120
 - 100
- A reinforced beam of size 300 mm width and 700 mm overall depth is subjected to a service moment of 80 kN-m. If M25 and Fe415 is used, it is to be designed as (use effective cover = 50 mm)
 - doubly reinforced section.
 - singly reinforced section.
 - over reinforced section.
 - None of these
- The effective flange width of T-beams spaced at 4 m with web depth of 1.2 m, web width of 0.5 m spanning 10 m with a flange slab of 150 mm thickness is
 - 4 m
 - 2 m
 - 3 m
 - 5 m
- An RC beam of 350 mm width and effective depth 550 mm is subjected to a factored shear force of 120 kN. M20 grade concrete is used for the beam. For shear reinforcement 6 mm diameter two legged mild steel stirrups are used. The spacing of shear reinforcement in beam is [take $\tau_{c,max} = 2.8$ MPa and $\tau_c = 0.60$ MPa]
 - 1500 mm
 - 410 mm
 - 90 mm
 - 300 mm
- A bar of 12 mm diameter is embedded in concrete for a distance of 15 cm. Calculate the maximum load which the bar can take if bond stress is not to exceed 0.5 N/mm²?
 - 1.4 kN
 - 3.5 kN
 - 2.0 kN
 - 2.8 kN

16. The minimum extension of steel bars of 12 mm diameter bar of Fe250 grade steel in M25 grade concrete with a design bond strength of 1.6 MPa and 135° standard bend at the end is
(A) 410 mm (B) 265 mm
(C) 150 mm (D) None of these
17. A reinforced concrete beam of 12 m effective span and 1.5 m effective depth is simply supported. If the total udl on the beam is 5 kN-m, the design shear force for the beam is
(A) 22.5 kN (B) 50 kN
(C) 30 kN (D) 40 kN
18. At the limit state of collapse, an RCC beam is subjected to total flexural moment of 300 kN-m, shear force of 30 kN, torque of 18 kN-m, the beam is of 350 mm wide and 450 mm gross depth with an effective cover of 30 mm. The equivalent nominal shear stress (τ_{ve}) as calculated using the code turns out to be lesser than the design shear strength (τ_c) of concrete. The equivalent shear force is
(A) 30 kN (B) 115 kN
(C) 80 kN (D) 200 kN
19. Based on the above data, the equivalent bending moment (M_{e1}) for designing the longitudinal tension steel is
(A) 400 kN-m (B) 300 kN-m
(C) 325 kN-m (D) 18 kN-m
20. A rectangular column of 350 mm $\times$ 650 mm is reinforced with 0.8% reinforcement based on gross area. Fe500 steel and M25 grade concrete is used. The ultimate load carrying capacity of column is
(A) 4.8 MN (B) 2.8 MN
(C) 3.2 MN (D) 5.6 MN
21. The composition of an air entrained concrete is given below:
Water: 180 kg/m³
Ordinary portland cement: 360 kg/m³
Sand: 600 kg/m³
Coarse aggregate: 1200 kg/m³
Assume the specific gravity of OPC, sand and coarse aggregate to be 3.0, 2.68 and 2.70 respectively. The air content in lit/m³ is ____.
- (A) 30 (B) 40
(C) 50 (D) None of these
22. A column of size 300 $\times$ 550 mm has unsupported length of 4.0 m and is braced against side sway in both directions. According to IS:456-2000, the minimum eccentricities (in mm) with respect to major and minor principle axes are
(A) 18 mm, 26.33 mm
(B) 26.33 mm, 18 mm
(C) 20 mm, 18 mm
(D) 26.33 mm, 20 mm
23. A simply supported reinforced concrete beam of length 12 m sags while undergoing shrinkage. Assuming a uniform curvature of 0.006 m⁻¹ along the span, the maximum deflection at mid span is
(A) 0.20 m (B) 0.11 m
(C) 0.30 m (D) 0.25 m
24. In a pre stressed concrete beam section shown in figure. The net loss is 15% and the final prestressing force applied at y is 700 kN. The initial fiber stresses (in N/mm²) at the top and bottom of beam were:



- (A) +49 and 58 (B) -58 and -49
(C) -49 and 58 (D) -58 and 49
25. A concrete column carries an axial load of 350 kN and a bending moment of 45 kN-m at its base. An isolated footing of 3 m $\times$ 5 m with 5 m side along the plane of bending moment, is provided under column. The CG of column and footing coincides, the net maximum and minimum pressures in kN/m² on the soil under the footing are respectively?
(A) 150, 98 (B) 100, 75
(C) 150, 120 (D) 134, 98

ANSWER KEYS

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|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. D | 2. A | 3. B | 4. C | 5. B | 6. A | 7. A | 8. D | 9. B | 10. C |
| 11. A | 12. B | 13. C | 14. C | 15. D | 16. B | 17. A | 18. B | 19. B | 20. B |
| 21. A | 22. D | 23. B | 24. C | 25. D | | | | | |