

Bachelor of Architecture, Third Year First Semester Examination, 2025

DESIGN OF STRUCTURES – I

Full Marks – 100

Time: 3 Hrs.

- **Answer any FIVE Questions. All Questions carry equal marks.**
 - The use of the following IS Codes is allowed in the examination hall:
IS-456:2000, SP-16, IS:800:2007, IS:808-1989, IS:4923-2017, IS:1161-2014
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1. Design a one-way RCC Slab for a rectangular panel size of 7m. X 3m., with all the edges simply supported to carry a Live Load of 2.5 kN/m^2 . Use M-20 grade concrete and Fe-415 grade reinforcement steel. Assume any other data as required and mention them specifically. Also, draw a neat sketch to show the cross-section of the slab showing the reinforcement details with appropriate clear covers.
2. An RCC Beam having a simply supported span of 4.5 meters, is carrying a Live Load of 8 kN/m in addition to its self-weight. The cross-section of the beam is 300 mm wide x 550 mm total depth. Calculate the reinforcement required at the mid-span for flexure only. Use M-20 grade concrete and Fe-415 grade reinforcement steel. Assume any other data as required and mention them specifically. Draw the beam cross-section at mid-span in a neat sketch, showing the reinforcement details and the appropriate clear covers.
3. Determine the Column Size and the reinforcements to be provided in an RCC short column of length 3.1 m., rigidly connected at both ends, subjected to an axial load of 600 kN. Assume a Square Cross-Section of the Column. Use M-20 grade of concrete and Fe-415 grade of reinforcement steel. Assume any other data as required and mention them specifically. Draw the Column cross-section in a neat sketch showing the reinforcement details and the appropriate covers.
4. Design a square isolated RCC footing for an RCC column of size 300 mm X 300 mm, reinforced with 8 numbers – 16 mm diameter bars, and carrying a service load of 800 kN. The safe bearing capacity of the soil is 160 kN/m^2 at a depth of 1.5 m below the ground. Assume M-20 grade concrete and Fe-415 grade

reinforcement steel for the footing. Assume any other data as required and mention them specifically. Draw the Footing cross-section and plan in a neat sketch showing the reinforcement details with the appropriate covers.

5. A Plated Beam is composed of the following plates:
Overall Depth = 800 mm
Top Plate = 450 mm X 20 mm
Bottom Plate = 300 mm X 25 mm
Web Plate Thickness = 12 mm
Determine the Section Class of this section as per Table 2 of IS:800-2007 Code. Assume the Neutral Axis at mid-depth. Grade of Steel: FY 250.
 6. A Tension Member is subjected to an unfactored tensile force of 400 kN and has a Square Hollow Section 100 x 100 x 6. The length of the member is 5 meters. Check whether the section is safe for the Tensile force applied. Consider Yst310 grade Steel. Assume any other data you require and specifically mention them in your design.
 7. A member of a Truss of length 3.0 meters and having a Circular Hollow Section 90 (CHS 90) of thickness 4 mm. The member is subjected to a factored Compressive Force of 200 kN. Check whether the section is safe for the given Compressive load. Consider Yst310 grade Steel. Assume any other data you require and specifically mention the same in your design.
 8. A simply supported Steel Beam, having a span of 8 meters and having a cross-section of ISMB 300, is laterally supported along its length. The beam is subjected to its self-weight and a uniformly distributed live load of 10 kN/meter. Check the adequacy of the section for the Bending Moment. Consider 250 grade Steel. Assume any other data you require and specifically mention the same in your design.
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