

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: B.TECH & B.ARCH  
BRANCH: CIVIL & ENVIRONMENTAL ENGINEERING & ARCHITECTURE

SEMESTER :  
SESSION : MO/2025

SUBJECT: CE301 STRUCTURAL DESIGN - I

TIME: 3 HOURS

FULL MARKS: 50

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- |   | CO      | BL |
|---|---------|----|
| Q.1(a) What is the <b>importance of Partial safety factor</b> for materials and loads as per IS456 ?. Explain with examples.  | [5] CO1 |    |
| Q.1(b) What is the <b>conceptual difference</b> between “ Limit State Method of design” and “ Working Stress Design methodology” as per IS456. Discuss it in tabular form.  | [5] CO1 |    |
| Q.2(a) Design a simply supported beam of span 5m , carrying a superimposed load of 30 KN/m ( DL+LL) against <b>bending moment and Shear force</b> . Use HYSD bars of grade Fe415 and concrete grade M25. Apply “ Limit State Method of Design “ as per IS456 . <b>Mention Table, Clauses of IS456 etc. clearly.</b>   | [5] CO2 |    |
| Q.2(b) Show typical <b>detail of reinforcements</b> of a <b>single span beam with column</b> through neat sketches  | [5] CO2 |    |
| Q.3(a) Design a rectangular slab of dimension 4m X 6m , having <b>three edges continuous and other edge discontinuous</b> , against a live load of 3 KN/sq.m, against <b>bending moment</b> only following deflection criteria. Use HYSD bars of grade Fe415 and concrete grade M25. Apply “ Limit State Method of Design “ as per IS456. <b>Mention Table, Clauses of IS456 etc. clearly.</b>      | [5] CO3 |    |
| Q.3(b) Show typical <b>detail of reinforcements</b> of a <b>Dog-legged Staircase</b> through neat sketch ( Plan & Longitudinal section).  | [5] CO3 |    |
| Q.4(a) What is the difference between <b>short and slender column</b> . <b>Mention Table, Clauses of IS456 etc. clearly.</b>  | [5] CO4 |    |
| Q.4(b) Design a RCC short column against a compressive load of $P = 1600 \text{ KN}$ , $M_x = 14 \text{ KN-m}$ and $M_y = 18 \text{ KN-m}$ . Use HYSD bars of grade Fe415 and concrete grade M25. Apply “ Limit State Method of Design “ as per IS456. <b>Mention Table, Interaction curves, Clauses of IS456 etc. clearly.</b> Show typical <b>detail of reinforcements</b> through neat sketch    | [5] CO4 |    |
| Q.5(a) Design a square Isolated footing against a compressive load of <b>1500 KN</b> . Grade of concrete M25 and grade of steel Fe 415. <b>Safe bearing capacity of soil = 110KN/sq.m</b> . Column dimension 400mmx400mm, Pedestal dimension 800mmx800mm. Design against <b>bending moment , one way shear and Two-way shear</b> as per IS456. <b>Mention Table, Clauses of IS456 etc. clearly.</b> | [5] CO5 |    |
| Q.5(b) Show typical <b>detail of reinforcements</b> of a <b>square Isolated footing</b> through neat sketches   | [5] CO5 |    |

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