

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

CLASS: B.TECH/B.ARCH  
BRANCH: CIVIL/ARCHITECTURE

SEMESTER : VI  
SESSION : SP/2023

SUBJECT: CE308 STRUCTURAL DESIGN - II

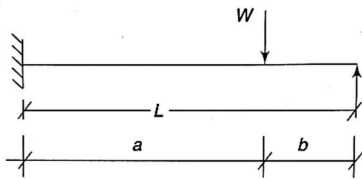
TIME: 3 Hours

FULL MARKS: 50

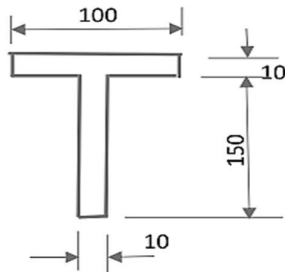
**INSTRUCTIONS:**

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.
  6. IS 800 and Steel Table are allowed in the examination hall.
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- Q.1(a) What is the relation between load factor and shape factor? [5] CO 1 BL K1,  
Determine the collapse load of the propped cantilever beam as shown in the following figure using the kinematic method. k3

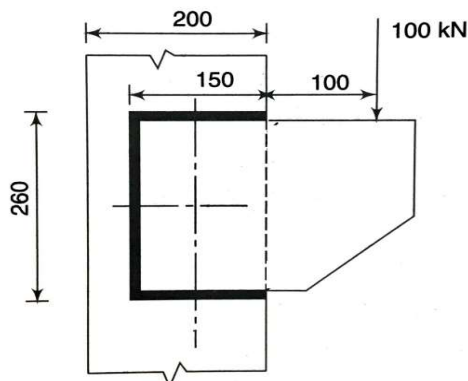


- Q.1(b) Find the shape factor for the section shown below. [5] 1 k2



- Q.2(a) Two plates of thickness of 12 mm are to be lap jointed by 20 mm diameter bolt of grade 4.6. Calculate the strength of the bolt. Assume steel of grade E250 (Fe410). Also assume that the threads of the bolt fall in the shear planes. Take end distance as 33 mm and pitch as 50mm. [5] 3 k3

- Q.2(b) A bracket plate is connected with the flange of a column ISHB 200 as shown in the figure below. Calculate the size of the weld required to support a factored load 100 kN. [5] 3 k4



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- Q.3(a) Write a short note on block shear failure. [5] 2 K2
- Q.3(b) A member of a truss consists of an angle ISA 75 x 75 x 6. It carries an ultimate tensile load of 75 kN and is connected to a gusset plate 8 mm thick with one leg. Determine the number of 16 mm diameter 4.6 grade ordinary bolts required for the joint. Arrange the bolts in single row and check the strength of the member in gross yielding and net section rupture. Check against block shear is not required. Assume strength of bolt in single shear as 29 kN, Grade of steel as E250, gauge for holes in angle leg as 40 mm. Sectional area of the angle is 866 mm<sup>2</sup>. [5] 2 K3
- Q.4(a) A 9 m long column is to carry a factored axial compressive load of 1100 kN. The column is restrained in position but not in direction at both ends. Design the column using two channel sections placed back to back and connected with lacing system. Design of lacing system is not required. Use steel of grade E250. [5] 1 k4
- Q.4(b) Design a slab base for a column section ISHB 200 @ 365.9 N/m carrying an axial load of 600 kN (service load). [5] 2 K2
- Q.5(a) Show the ways of providing lateral restraints to the compression flange of beam with the help of diagram. [5] 3 K1
- Q.5(b) Design a laterally unsupported beam for the following data: [5] 1 k4  
 Effective span: 4 m  
 Maximum bending moment: 550 kN-m  
 Maximum shear force: 200 kN  
 Steel of grade: E 250.  
 Check for web bearing and deflection is not required.

.....25/04/2023.....M