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Reg. No. :

Question Paper Code : 50345

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Sixth Semester

Civil Engineering

CE 8601 — DESIGN OF STEEL STRUCTURAL ELEMENTS

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Use of IS 800 is permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Mention are the two methods used for designing steel structures.

2.   State allowable stress for design.

3.   List the three main types of fasteners used in steel structures.

4.   What is the concept of shear lag in bolted connections?

5.   Give two uses of lacing and battening in tension members.

6.   Define slenderness ratio of a tension member.

7.   Name two types of failures that can occur in compression members.

8.   What is the difference between a short column and a slender column?

9.   Define web buckling in beams.

10. Compare laterally supported and laterally unsupported beams.

PART B — (5 × 13 = 65 marks)

11. (a)   Design a laterally supported hot-rolled steel beam for a span of 6 meters. The beam will support a uniformly distributed load of 12 kN/m and is to be made of grade S355 steel. Use the allowable stress design method and assume a live load factor of 1.5 and a dead load factor of 1.25.

Or

     (b)   Discuss the design of angle tension and compression members in steel structures using the allowable stress design method.

12. (a) (i) Describe the different modes of failure that can occur in bolted and welded connections. (7)

(ii) How can mode of failures be prevented during the design and construction process? (6)

Or

(b) Design a bolted connection for two plates that are 10 mm thick and 150 mm wide. The connection will be subjected to an axial load of 50 kN and will use grade 8.8 bolts. Assume that the bearing strength of the bolts is 200 MPa and the allowable stress on the plates is 165 MPa.

13. (a) (i) Discuss the design of built-up tension members. (7)

(ii) Explain the advantages and limitations of using built-up tension members. (6)

Or

(b) A built-up tension member consists of two L-shaped angles connected by a gusset plate. The member is required to carry a tensile load of 120 kN. Determine the minimum size of the angles and gusset plate required if the allowable tensile stress is 150 MPa. Assume a bolt diameter of 16 mm and a bolt spacing of 50 mm.

14. (a) (i) Explain the design of axially loaded solid section columns. (7)

(ii) Discuss the advantages and limitations of using solid section columns. (6)

Or

(b) A built-up column consists of four ISA 100 × 75 × 8 angles and two 10 mm think gusset plates. The length of the column is 3.5 m and it is required to carry a compressive load of 200 kN. The allowable compressive stress is 150 MPa. Determine the minimum size of the gusset plates required.

15. (a) (i) Discuss the design of plated beams with cover plates. (7)

(ii) Explain the advantages and limitations of using cover plates. (6)

Or

(b) Explain the step by step perceive of design of laterally unsupported rolled section as per IS.

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PART C — (1 × 15 = 15 marks)

16. (a) Explain the design process for steel structures, including the steps involved and the considerations that need to be taken into account during each stage.

Or

(b) Derive the expression for the flexural strength of a rectangular beam section.

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