Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 20334

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Sixth Semester

Civil Engineering

CE 8601 — DESIGN OF STEEL STRUCTURAL ELEMENTS

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

(Use of IS 800-2007 & Steel tables is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Recall the recommendations as per IS 800 : 2007 the minimum pitch bolts in a row.

2. What is the allowable deflection of Purlins and Girts as per IS 800 : 2007 for the Elastic cladding?

3. Define bolt value.

4. Write the formula for equivalent stress as per IS 800 – 2007.

5. What is the allowable slenderness ratio of members always under tension?

6. Name any four tension members.

7. What are the types of compression members?

8. Define slenderness ratio.

9. Define laterally unsupported beam.

10. Write short notes on Web buckling.

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PART B — (5 × 13 = 65 marks)

11. (a) Write notes on Partial safety factors for Loads with respect to strength and serviceability and Partial safety factors for Materials for limit state method.

Or

(b) What is meant by Hot rolled sections? List out any five numbers of Hot rolled sections with neat sketch and mark their salient features.

12. (a) Design a Lap joint between the two plates each of width 120 mm, if the thickness of one plate is 16 mm and the other is 12 mm. The joint has to transfer a design load of 160 kN. The plates are of Fe 410 Grade. Use bearing type bolts.

Or

(b) A tie member of a roof consists of ISA 100 × 75 × 8 mm. The angles are connected to either side of a 10 mm gusset plates and the member is subjected to a working pull of 300 kN. Design the welded connection. Assume connections are made in the workshop.

13. (a) Determine the design tensile strength of the plate 130 mm × 12 mm with the holes for 16 mm diameter bolts as shown in Fig.1 Steel used is of Fe 456 grade quality.
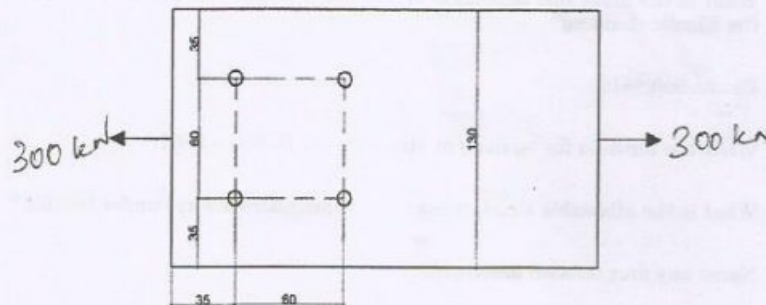

Fig. 1

Or

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(b) Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 225 kN. The member is subjected to the possible reversal of stress due to the action of wind. The effective length of the member is 3 m. Use 20 mm shop bolts of grade 4.6 for the connection.

14. (a) Design a single angle strut connected to the gusset plate to carry 180 kN factored load. The length of the strut between center to center connection is 3 m.

Or

(b) A column 4 m long has to support factored load of 6000 kN. The column is effectively held at both ends and restrained in direction at one of the ends. Design the column using Beam sections and plates.

15. (a) A simply supported beam ISMB 400©61.6 kg/m has an effective span of 5 m Find (i) the design bending strength of the beam (ii) the design shear strength of the beam (iii) the intensity of UDL that the beam may carry under service condition (iv) the maximum deflection. Assume that the beam is laterally supported. The grade of the steel is Fe 250.

Or

(b) Design an I section purlin of the span of 4 m subjected to an UDL of 1.5 kN/m in the plane of the minor axis and 0.5 kN/m in the plane of the major axis under service condition. Assume that the purlin is continuous over the supports and no lateral buckling occurs. The grade of steel is Fe 250.

PART C — (1 × 15 = 15 marks)

16. (a) Design a built up column of the effective length of 5 m to carry an axial load of 900 kN. Using lacing. Design the connections using fillet welds. The grade of the steel is Fe 250. The buckling of the built up column to class "C" Assume fck as 150 N/mm².

Or

(b) Design a slab base for a column ISHB 300 carrying an axial factored load of 1000 kN. M20 concrete is used for the foundation. Provide welded connection between column and base plate.

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