

Roll No.

OLE-24287

B. Tech. 5th Semester (Civil Engg.)

Examination – April, 2021

DESIGN OF STEEL STRUCTURE - I

Paper : CE-301-F

Time : Three Hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks. Use of IS 800- 1984 or 2007 and steel table is allowed . Assume suitable data if missing.

1. Explain the following : 4 × 5 = 20

- (a) Explain shear lag effect.
- (b) Draw stress strain curve of mild steel and explain the salient features.
- (c) For joints subjected to fatigue, which type of connector is preferred ?

- (d) How the laterally supported beam fails ?
- (e) How do you improve the shear resistance in plate girder ?

UNIT – I

- 2. (a) Calculate the strength of a 18mm diameter bolt of grade 4.6 for the following cases. The main plated to be jointed are 10mm thick. A) Lap joint B) Double cover butt joint; the cover plate being 8 mm thick. 10
- (b) State physical and mechanical properties of steel as structural material. 10
- 3. (a) Compare the relative merits and demerits of the three design philosophies for steel structures. 10
- (b) Design a tension member to carry a pull of 830 kN. The member is 3.2m between c/c of intersection. Design the member using channel section. 10

UNIT – II

- 4. Design a column of effective length 6.00m. It is subjected to a factored axial compressive load of 27000kN. Provide two channels back to back connected with battens by site welded connection. Use steel of grade Fe410. 20

5. A column ISHB 450@92.50 kg/m carries a factored axial compressive load of 1900 kN and factored bending moment of 90 kNm. Design the base plate and its connections. Assume concrete of M20 grade and Fe 250. 20

UNIT – III

6. Design a laterally supported beam for the following data : 20

Effective span: 5m

Maximum bending moment: 500 kNm

Maximum shear force: 180 kN

Steel of grade: Fe250

7. Design gantry girder in an industrial building for two moving cranes for the following data : 20

Crane capacity= 400 kN

Distance between c/c of wheels = 3.6m

Distance between c/c of gantries= 16.0m

Span of gantry girder = 5m .

Weight of rails= 300 N/m

Weight of each crane including crab = 300 kN

Minimum approach of crane hook= 1.2m

Height of rails = 75mm

Yield stress of steel = 250 N/mm²

UNIT – IV

8. A welded plate girder of span 20m has following elements : 20

Flange plates 400×16 mm one plate for each flange;
web 2000×10 mm.

Compute the sectional properties and moment of resistance of the plate girder. Design also the end bearing stiffeners, if the plate girder is to carry uniformly distributed load of 300 kN/m. The web is shear resistance.

9. Design a plate girder, 40m span, to be provided in a hall. The superimposed load, exclusive of self weight is 200 kN/m. design the web splice at one third of span and flange angle splice at one fourth of the span. 20
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