

B.Tech III Year II Semester (R20) Supplementary Examinations January 2024

DESIGN OF STEEL STRUCTURES

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- | | |
|---|----|
| (a) Under what circumstances do we use slot welds and plug welds. | 2M |
| (b) What do you mean by prying forces? | 2M |
| (c) What are the main purpose of lacings and battens? | 2M |
| (d) Define slenderness ratio and what are the limitations for compression members. | 2M |
| (e) What is shape factor? | 2M |
| (f) What is web buckling and when it occurs? | 2M |
| (g) What do you understand by in plane and out plane moments? | 2M |
| (h) Mention the advantages and disadvantages of welded connections. | 2M |
| (i) Under what circumstances plate girder is suitable and give the advantages over simple beam. | 2M |
| (j) What is the minimum moment of inertia for intermediate stiffener? | 2M |

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

- 2 Explain the concept of design strength and deflection limits An ISMC 250 @ 298 kg/m is used as a tie member to transmit a factored load of 800 kN. The channel section is connected to a gusset plate of 10mm thickness. Design a fillet weld if the lap length is limited to 300 mm. Provide slot welds if required. 10M

OR

- 3 Design a double cover joint between the two plates of width 300 mm, if the thickness of one plate is 18 mm and the other is 10 mm. The joint has to transfer a working load of 260 kN. The plates are of Fe 410 grade. Use bolt of grade 4.6. 10M

- 4 Design a slab base for a column ISHB 300@577 N/m carrying an axial load of 1000 KN. Adopt M20 concrete and welded connection between column and base plate. 10M

OR

- 5 Determine the load carrying capacity of a strut made with 2 ISA 100 x 100 x 8 mm back to back if the length of member is 3.6 m and welded to a gusset plate of 10 mm thick. 10M

- 6 Design a laterally supported beam of effective span 6 m for the following data: 10M
Grade of steel: Fe410
Maximum bending moment: 150 kNm
Maximum shear force: 210 KN.

OR

- 7 Design the simply supported main beam of a building supporting concrete floor slab with the following data: Centre to centre distance of beams – 6 m Span of beam – 7 m Thickness of concrete slab – 240 mm Finished screed – 40 mm thick Weight of concrete slab and finished screed- 24kN/m³ Imposed load – 4kN/m². 10M

Contd. in Page 2

- 8 Design the bracket connection shown below. The connection supports a load of 150 kN. The column section is ISHB 150@ 300.19 N/m. The thickness of bracket plate is 10 mm. Use M16 bolts of grade 4.6. 10M
- OR**
- 9 A column ISHB 200@ 392.4 N/m has to support a beam ISHB 300@433.6 N/m. The beam transmits a factored end reaction of 100 kN. Design an unstiffened welded seat connection. Consider seat angle 100 x 75 x 10 mm and clearance between the column flange and beam = 5 mm. 10M
- 10 Design a welded plate girder of 20 m span to support a uniformly distributed load of 70 KN/m over the span using the following data. Yield stress of steel is 250 N/mm^2 , top flange restrained laterally. Design the cross sectional details of the plate girder to confirm to the specifications of IS 800-2007 Given data effective span of girder = 20 m Distributed live load = 75 KN/m Yield stress of steel = 250 N/mm^2 . 10M
- OR**
- 11 List any seven elements of the plate girder bridge & explain its important features related to the design and Write the design steps for design of intermediate and bearing stiffeners. 10M

B.Tech III Year II Semester (R20) Regular Examinations August 2023

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(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Use of IS 800-2007, IS: 875, steel tables & railway design standards code are to be permitted.

PART – A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- | | |
|---|----|
| (a) What are the factors that will govern the structural design? | 2M |
| (b) What are the various types of structural steel sections? | 2M |
| (c) Name the modes of failure in a column. | 2M |
| (d) Why the lateral systems are provided in compound columns? | 2M |
| (e) What are the types of tension members? | 2M |
| (f) How the beams are failed? | 2M |
| (g) What is bracket connection? | 2M |
| (h) Differentiate between the bending and buckling of a beam. | 2M |
| (i) Mention the basic design assumptions of a plate girder. | 2M |
| (j) Name different types of connections used for connecting structural members. | 2M |

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

- 2 (a) Explain about the loads to be considered in the Limit State design of steel structures. 5M
 (b) What are the various steps involved in the construction of steel structures? 5M
- OR**
- 3 (a) Explain the concept of design strength and deflection limits. 5M
 (b) Write a short note on service ability and stability check. 5M
- 4 (a) Design a slab base for a column ISHB 300@577 N/m carrying an axial load of 1000 KN. 5M
 Adopt M20 concrete and welded connection between column and base plate.
 (b) Discuss general requirement for battening system as per IS 800. 5M
- OR**
- 5 (a) Discuss various failure modes of compression members. 5M
 (b) Design a built-up column 9 m long 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 with connecting system as battens with bolted connection. Use channels back to back and steel of grade Fe410. 5M
- 6 Design a laterally supported beam of effective span 6 m for the following data: 10M
 Grade of steel: Fe410
 Maximum bending moment: 150 kNm
 Maximum shear force: 210 KN.
- OR**
- 7 (a) Explain the procedure to find out compressive stress from IS 800-2007. 5M
 (b) Determine the load carrying capacity of a strut made with 2 ISA 100 x 100 x 8 mm back to back if the length of member is 3.6 m and welded to a gusset plate of 10 mm thick. 5M

Contd. in page 2

- 8 A beam ISMB 450 transmits an end reaction of 250 kN to the flange of column ISMB 600. 10M
Design a weld stiffened seat connection. Steel is of grade $f_y = 250$ MPa.

OR

- 9 (a) How are the building connections classified based on their moment rotation characteristics? 5M
(b) Explain in design principles of eccentric connections with brackets. 5M

- 10 Design a welded plate girder 24 m in effective span and simply supported at the two ends. It 10M
carries an uniformly distributed load of 100 kN/m.

OR

- 11 What is plate girder? Explain different components of a plate girder and also discuss about 10M
various types of stiffeners.
