Code No: R1941011 **R19** **Set No. 1**

IV B. Tech I Semester Regular Examinations, November – 2022
DESIGN & DRAWING OF STEEL STRUCTURES
(Civil Engineering)

Time: 3 hours **Max. Marks: 75**

Question paper consists of Part-A and Part-B
Answer any ONE question from Part-A
Answer any THREE questions from Part-B
Use of IS 800:2007, IS: 875 (Part III)-1987, structural steel tables are to be permitted in the examination hall.

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PART–A ***(30 Marks)***

1 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 the ends. Design the column with connecting system as battens with suitable connections. Use two channel sections back to back. Use steel of grade Fe 410. Assume any missing data. [30]
Draw to scale the cross-section and sectional elevation of the column with batten details.

(OR)

2 Design a welded plate girder 24 m in span and laterally restrained throughout. It has to support a uniform load of 100 kN/m throughout the span excluding self weight. Design the girder and end bearing stiffeners. The steel for the flange and web plates is of grade Fe 410. Design the cross section, the end load bearing stiffener and connections. Assume any missing data. [30]
Draw to scale the cross section and longitudinal section of the plate girder.

PART–B ***(3x15=45 Marks)***

3 a) Write the advantages and disadvantages of bolted connection [7]
b) What are lap joints? What is their main advantage? What welds are used in lap joints? [8]

4 A T-section consists of a flange 150 × 10 mm and a web of 140 × 10 mm. The section modulus of the T-section is 54600 mm^3.This section is used as a simply supported beam of 4m span and carries a UDL of 25 KN/m on the whole span. Determine the shape factor of the beam and also calculate the collapse load for the beam. Assume yield stress as 250 MPa. [15]

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5	Two plates of thickness 12 mm and 10 mm are to be joined by a groove weld. The joint is subjected to a factored tensile force of 275KN. Assuming an effective length of 150 mm, check the safety of the joint for (i) Single V groove weld joint and (ii) Double V groove weld joint. Assume Fe 410 grade steel plates and that the welds are shop welded.	[15]
6	Explain the design procedure of slab base with a suitable numerical example.	[15]
7	A beam of span 5 m carrying a load of 25 kN/m on the left half and a concentrated load of 45 KN on the quarter span on the right half. Design the beam assuming that the beam is laterally unsupported. Assume that full torsional and warping restraints are provided at the ends of the beam.	[15]

Code No: R1941011 **R19** **Set No. 2**

IV B. Tech I Semester Regular Examinations, November – 2022
DESIGN & DRAWING OF STEEL STRUCTURES
(Civil Engineering)

Time: 3 hours **Max. Marks: 75**

Question paper consists of Part-A and Part-B
Answer any ONE question from Part-A
Answer any THREE questions from Part-B
Use of IS 800:2007, IS: 875 (Part III)-1987, structural steel tables are to be permitted in the examination hall.

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PART–A ***(30 Marks)***

1 A steel column in to take a central load of 1600KN to built four equal angles forming a 50 cm × 50 cm square. The height of the column is to be 6m with hinged ends. Design a suitable column section and a lacing system. [30]
Draw to scale the plan and Elevation.

(OR)

2 Design welded plate girder using Fe 410 grade steel using the following data; the girder is simply supported over a span of 27 m and supports and uniformly distributed live load of 20 kN/m, together with two concentrated loads of 450 kN each located at 6 m from either supports. The top compression flange is restrained laterally. Design the cross section with a thinner web and suitable stiffeners conforming to the IS 800-2007 codal specifications. [30]
Draw to scale the cross section and longitudinal section of the plate girder.

PART–B ***(3x15=45 Marks)***

3 a) What are the advantages and disadvantages of steel as a structural material? [5]

b) A simply supported beam of uniform cross section and span 2L is propped at the centre. Find out the collapse load if, a concentrated load is applied at the centre of the left hand span. [10]

4 a) Briefly explain the types of welded connections with neat sketches. [5]

b) Design a fillet welded joint to join two plates each of thickness 10 mm and 250 mm width for 100% efficiency. (Take f_y = 250 MPa) [10]

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5	Design a simply supported beam of 6 m effective span, carrying a uniformly distributed load of 25 KN/m over entire length, if compression flange is laterally unsupported.	[15]
6	A column in building in 3.35 m long with both ends restrained in position and direction both along z-z and y-y axis. The column is required to carry a lead of 2080 KN. Design the column section.	[15]
7	A column section is ISHB 350 @ 72.4 kg/m and is subjected to an axial compressive load of 1050 KN under service conditions. Design the slab base for the column is load gets transmitted to the base plate by welded connections and column end and base plate are not machined for bearing. The base sets on a concrete pedestral of M20 concrete.	[15]

Code No: R1941011 **R19** **Set No. 3**

IV B. Tech I Semester Regular Examinations, November – 2022
DESIGN & DRAWING OF STEEL STRUCTURES
(Civil Engineering)

Time: 3 hours **Max. Marks: 75**

Question paper consists of Part-A and Part-B
Answer any ONE question from Part-A
Answer any THREE questions from Part-B
Use of IS 800:2007, IS: 875 (Part III)-1987, structural steel tables are to be permitted in the examination hall.

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PART–A *(30 Marks)*

1 Design a built up column 9 m long to carry a factored axial compressive load of 1200 KN. The column is restrained in position but not in direction at both the ends. Design the column with connecting system as battens with bolted connections. Use two channel sections back to back. Use steel of grade Fe410. Assume any missing data. Draw to scale the cross section and longitudinal section. [30]

(OR)

2 Design a welded plate girder subjected to a maximum factored moment of 3500 KN-m and a factored shear force of 500 KN. Use intermediate stiffener only. Assume any missing data. Draw the cross section and longitudinal section of the plate girder. [30]

PART–B *(3x15=45 Marks)*

3 Steel beams having a clear span of 9 m are resting on 150 mm wide end bearings. The beams spacing is 3 m and the beams carry a dead load of 5 kN/m^2, including the weight of the section. The imposed load on the beam is 15 KN/m^2. Design the beam if the depth is restricted to 575 mm and the yield strength of the steel is 250 N/mm^2. [15]

4 Compute the design compressive load for a column 3.2 m long and its sections is ISHB @ 710.2 N/m. The column is fixed at both the ends. Use steel of grade Fe410. [15]

5 Design a diamond pattern double cover butt joint to join two plates of size 210 × 10 mm each with 20 mm diameter bolts of grade 4.6. The plates are required to carry a factored tensile load of 435 KN. Use steel of grade Fe410. [15]

6 a) What are the various design philosophies for designing steel structures? [5]

b) Find the shape factor for triangular section of base ‘b’ and height ‘h’. [10]

7 Design a slab base for a column ISHB 200 @ 365.9 N/m subjected to an factored axial compressive load of 1500 KN is transferred to the base plate by direct bearing of column flanges. The base rests on concrete pedestal of grade M20. [15]

Code No: R1941011 **R19** **Set No. 4**

IV B. Tech I Semester Regular Examinations, November – 2022
DESIGN & DRAWING OF STEEL STRUCTURES
(Civil Engineering)

Time: 3 hours **Max. Marks: 75**

Question paper consists of Part-A and Part-B
Answer any ONE question from Part-A
Answer any THREE questions from Part-B
Use of IS 800:2007, IS: 875 (Part III)-1987, structural steel tables are to be permitted in the examination hall.

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PART–A ***(30 Marks)***

1 Design a simply supported gantry girder of effective span 6 m to carry a crane capacity of 100 KN. The weight of the crane excluding the crab is 150 KN and the weight of the crab is 20 KN. The weight of the rail is 300 N/m. The minimum approach of the crane hook is 1.0 m. The wheel base is 3 m. The centre to centre distance between the gantry girders is 18 m. The height of the rail is 75 mm. Assume that the lateral support is provided to the compression flange throughout its length. Draw to scale the cross section and longitudinal section. [30]

(OR)

2 Design a laced column 10 m long to carry a factored axial load of 1100 KN. The column is restrained in position but not in direction at both ends. Providing single lacing system with bolted connection. Design the column with two channels placed back to back. Draw the detailing of the column. Assume any missing data. Draw to scale the cross section and longitudinal section. [30]

PART–B ***(3x15=45 Marks)***

3 a) What is a plastic hinge? In what way is it different from an ordinary hinge? [6]

b) Determine the shape factor for Circular Section having diameter 'D'. [9]

4 Design the section for diagonal member of a roof truss which carries a tensile load of 270 KN. Design the connection of member to 16 mm thick gusset plate also. The length of the connection is not to exceed 350 mm. Provide lug angles if required. Use Fe410 grade of steel and bolts of grade 4.6. [15]

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5	A cantilever beam of length 2 m carries a factored concentrated load of 210 KN at free end. If section available is ISMB 300 @ 402 N/m, design the flange plates if required.	[15]
6	A channel section is required to be welded to a 10 mm thick gusset plate. Design the channel if it is required to carry a factored tensile load of 750 KN.	[15]
7	Design a channel section purlin without sag bars for a trussed roof from the following data: Span of roof = 10*m* Spacing of purlin along slope = 2.5*m*; Spacing of truss = 4*m* Slope of roof truss = 1 *vertical*, 2 *horizontal*; Wind load on roof = 1100 N/m^2 Vertical loads from roof sheets =150N/m^2	[15]