Code No: R2032011 **R20** SET - 1

III B. Tech II Semester Regular Examinations, JULY-2023
DESIGN AND DRAWING OF STEEL STRUCTURES
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **ONE** Question from **Part–A**, and any **THREE** Questions from **Part–B**
Please specify the IS codes to be allowed to the student in the Examination hall.

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PART–A **(28 Marks)**

1 Design gusseted base for a column ISHB 350 @710N/m with two plates 450mm X 20mm carrying a factored load of 4000kN. The column is supported on concrete pedestal to be built with M20 grade of concrete. Fe 410m grade of steel. Draw to scale plan of gusset base with details and side views of the gusset base. And also design connections between the base plate and foundation. [28M]

(OR)

2 Design a simply supported gantry girder to carry an electric overhead trevelling crane for the following data: [28M]
Crane capacity: 320kN
Weight of crane and crab: 300kN
Minimum approach of crane hook: 1.2m
Distance between c/c of wheels: 3.2m
Distance between c/c of gantries : 16.0m
Span of gantry girder : 4.0m
Weight of rails : 300N/m
Height of rails :75mm.
Steel is of grade Fe410.
Design also the field welded connection if required. The support bracket connection need not be designed. Draw cross section of gantry girder.

PA RT–B **(42 Marks)**

3 An 150mm X 115 mm X 12 mm angle section is to be connected to a 12mm thick gusset plate at site. Design the fillet weld to carry a load carry a load equal to the strength of the member. [14M]

4 A simply supported beam of span 5m is subjected to a superimposed load of 30 kN/m over entire span and a concentrated load of 200 kN at mid span. Design the beam and check for deflection and shear. The beam is laterally supported throughout. [14M]

5 Design an I section purlin with and without sag bars for trussed roof from the following data: [14M]
Span of roof = 10 m, spacing of purlin along slope of truss – 1.8 m
Spacing of truss = 4 m slope of roof truss = 1 vertical 2 horizontal
Wind load on roof surface normal to roof = 1200 N/mm^2.
Vertical loads from roof sheets = 200 N/mm^2.

6 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. [14M]

7 A welded plate girder of span 20m consists of the following elements. Flange plates 500X32mm one plate for each flange; web 2200X 8mm. The girder is subjected uniformly distributed load of 80kN/m. It is also subjected to lateral load of 2kN at mid-height of the girder. Design the vertical stiffeners. [14M]

Code No: R2032011 **R20** SET - 2

III B. Tech II Semester Regular Examinations, JULY -2023
DESIGN AND DRAWING OF STEEL STRUCTURES
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **ONE** Question from **Part–A**, and any **THREE** Questions from **Part–B**
Please specify the IS codes to be allowed to the student in the Examination hall.

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PART–A **(28 Marks)**

1 Design gusseted base for a column ISHB 250 @84.96kg/m with two cover plates 300mm X 20mm one to each flange to transmit an axial load of 1800kN. The column is supported on concrete pedestal to be built with M20 grade of concrete. Fe 410m grade of steel. Draw to scale plan of gusset base with details and side views of the gusset base. And also design connections between the base plate and foundation. [28M]

(OR)

2 Design a gantry girder to be used in an industrial building carrying a manually operated overhead travelling crane, for the following data: [28M]
(i) Crane capacity 200 kN.
(ii) Self-weight of the crane girder excluding trolley 200 kN.
(iii) Self-weight of the trolley, electric motor, hook, etc. 40 kN
(iv) Approximate minimum approach of the crane hook to the gantry girder 1.20 m.
(v) Wheel base 3.5 m.
(vi) c/c distance between gantry rails 16 m.
(vii) c/c distance between columns (span of gantry girder) 8 m.
(viii) Self-weight of rail section 300 N/m.
(ix) Diameter of crane wheels 150 mm.
(x) Steel is of grade Fe410.
Design also the field welded connection if required. The support bracket connection need not be designed. Draw cross section of gantry girder.

PART–B **(42 Marks)**

3 A 120mm diameter pipe 0.50m long is welded at right angles to a 10mm thick plate. A vertical load of 8kN acts at its free end. The pipe is 6mm thick. Design the welded connection. [14M]

4 A simply supported beam of effective span 8 m carries a U.D.L of 40 kN/m. Taking fy = 250 N/mm^2 and E = 2 x 10^5 N/mm^2. Design the beam as laterally supported. [14M]

5 Design a tension member to carry a pull of 830kN. The member is 3.2m between c/c of intersections. Design the member using channel section. [14M]

6 Design a column base for a factored axial compressive load of 700kN and a factored bending moment of 150kN-m about the major axis. The column section provided is ISHB 400 @ 806.4N/m. Design the anchor bolts also, if required. The bearing pressure from concrete may be assumed to be 6.0kN/m^2. [14M]

7 Design a welded plate girder of 30.0m span. It is subjected to a uniformly distributed load of 32kN/m. design also the stiffeners and their connections. [14M]

Code No: R2032011 **R19** SET - 3

III B. Tech II Semester Regular Examinations, JULY -2023
DESIGN AND DRAWING OF STEEL STRUCTURES
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **ONE** Question from **Part–A**, and any **THREE** Questions from **Part–B**
Please specify the IS codes to be allowed to the student in the Examination hall.

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PART–A **(28 Marks)**

1 Design the most critical section of a welded plate girder of constant depth to carry a superimposed load of 100kN/m, in addition to its self-weight over a span of 20m with two equal overhangs of 3m on each side, thus making total length of the girder 26m. Design the following i. cross section, ii. Curtailment, iii. End bearing stiffener. [28M]

(OR)

2 Design a column of effective length 6 m. It is subjected to a factored axial compressive load of 2200 kN. Provide two channels back to back connected with battens by site welded connection. Draw to scale the cross-section and sectional elevation of the column with batten details [28M]

PART–B **(42 Marks)**

3 a) Explain various modes of failure (behavior) of bolted connections with neat sketches [6M]

b) Design a double cover butt joint to connect two plates, each 12mm thick and 300mm wide. The service load to be transferred is 200kN. [8M]

4 Design a laterally restrained simply supported beam section of 6 m clear span and carrying factored UDL: 30 kN/m. Assume stiff bearing length 125 mm. Apply necessary design checks. [14M]

5 A column section ISHB 150 @265.9 N/m is to be spliced with another column section ISHB 150 @339.4 N/m. The factored load on the column is 400kN. Design the splice. [14M]

6 A steel column consists of ISHB 300 with cover plate 300 mm x 25 m for each flange. The column carries an axial load of 2300 kN. Design a gussted base plate for the column. Use 18 mm diameter rivets. [14M]

7 Design a hand operated travelling crane simply supported by gantry girder for the given data: Span of gantry girder = 5 m, span of crane girder = 15 m, crane capacity = 200 kN, self-weight of crane girder excluding trolley = 200 kN, self – weight of trolley = 30 kN, minimum hook approach = 1 m, distance between wheels = 3.5 m c/c, self-weight of rails = 0.3 kN/m. Checks for buckling and deflections are not required. [14M]

Code No: R2032011 **R19** SET - 4

III B. Tech II Semester Regular Examinations, JULY -2023
DESIGN AND DRAWING OF STEEL STRUCTURES
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **ONE** Question from **Part–A**, and any **THREE** Questions from **Part–B**
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PART–A **(28 Marks)**

1 A simply supported welded plate girder has an effective span of 30 m with a u.d.l of 30 kN/m and a two concentrated load of 150 kN each acting at 10 m from both ends. It is fully restrained against lateral buckling throughout the span. Design the central section using thin web with K = 100 and end bearing stiffener. Also design the welded connection between flange and web. Take fy = 250 MPa, fu = 415 MPa and ultimate stress of weld = 410 MPa. Also design curtailment of plate. [28M]

(OR)

2 Design a built up laced column and associated connecting elements to carry an axial load 1000 kN and moment 30 kN-m. The column height is 12 m, hinged at bottom and top, and built with Four angle sections placed in the form of back to back and connected by field weld joints of laced system. Neatly sketch and detail the built up section and apply necessary design checks. Use steel grade Fe410. [28M]

PART–B **(42 Marks)**

3 Design a connection between beam ISMB 450 and flange of column ISHB 300 @577N/m to transmit a shear force of 100kN and a moment of 120kN-m. Use 24bolts at 75mm pitch. [14M]

4 a) Design a simply supported beam of effective span 1.5m carrying a factored load of 450kN at mid span. [8M]

b) Determine the plastic section modulii Z_{px} and Z_{py} for the beam with equal flanges, Flanges 200X 18mm, Web 300X 12mm. [6M]

5 Deign a Channel section of roof Purlin with the following data: Spacing of truss 3 m (centre to centre), Spacing of purlin: 1.2 m, Angle of truss 30^0, weight of roof cover: 120 N/m^2, Wind load: 1.30 kN/m^2. Neatly detail the weld joint and connection system. [14M]

6 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. [14M]

7 Discuss in detail the elements of gantry girder, loads on the gantry girder and their design considerations. [14M]