Code No: RT32013 **R13** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, April - 2017
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
Use of IS: 800-2007 and Structural (steel) tables are allowed. For all designs adopt Limit State Method

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PART –A

1 Design a simply supported gantry girder to carry an electric overhead travelling crane for the following data: [28M]

Crane capacity	320kN
Weight of crane and crab	300kN
Weight of crane	200kN
Minimum approach of crane hook	1.20m
Distance between c/c of wheels	3.20m
Distance between c/c of gantries	16.0m
Span of gantry girder	4.00m
Weight of rails	300N/m
Height of rails	75mm
Yield stress of steel	280MPa

Draw to scale i) the cross-section, ii) the longitudinal section.

2 Design a beam of 5m effective span, carrying a uniform load of 20kN/m if the compression flange is laterally unsupported. And also check for deflection and shear. Draw to scale i) the cross-section, ii) the longitudinal section and iii) plan. [28M]

PART –B

3 A column section ISHB@577N/m is carrying a factored axial load of 600kN, a factored moment of 30kN and a factored shear force of 60kN. Design a suitable column splice. Assume ends are milled. [14M]

4 Design a slab base for a column ISHB 300@0.588kN/m carrying a load of 1000kN. It is supported on concrete pedestal having bearing capacity of $4N/mm^2$. [14M]

5 Design a tension member 3.4m between c/c of intersections and carrying a pull of 145kN, the member is subjected to reversal of stresses. [14M]

6 Design a welded plate girder of span 30m. It is subjected to a uniformly distributed load of 32kN/m. use the steel with yield stress 250MPa. [14M]

7 Determine the basic wind pressure to be considered for a shed in the outskirts of Bangalore. Given: [14M]
Structure: General purpose with probable life of 50 years
Terrain category: I, Building class: B
Eve's board height: 11 m
Topography: Plain Area.

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Code No: RT32013 **R13** SET - 2

III B. Tech II Semester Regular/Supplementary Examinations, April - 2017
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
Use of IS: 800-2007 and Structural (steel) tables are allowed. For all designs adopt Limit State Method

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PART –A

1 Design as.s gantry girder to carry one electric over head travelling crane. [28M]

Span of gantry girder	6.5m
Crane capacity	250kN
Span of crane girder	16m
Self weight of crane girder excluding trolly	200kN

Draw to scale i) the cross-section, ii) the longitudinal section.

2 Design a gusseted base for a column section ISHB 350@724N/m subjected to an axial load of 3500kN. The base rests on a M15 concrete pedestal. The safe bearing pressure of concrete may be assumed to be $4N/mm^2$. Draw to scale the plan and elevation. [28M]

PART –B

3 Design a tension member 3.6m between c/c on intersections and carrying a pull of 146kN. The member is subjected to reversal of stresses. [14M]

4 Explain various components of roof trusses with neat sketches in brief. [14M]

5 Design a simply supported beam of span 4m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 20kN/m imposed load and 20kN/m dead load. Assume fe 410 grade steel. [14M]

6 A column section ISHB 450@ 872kN/m is to be spliced with a column ISHB 300 @ 588N/m. The load on the column is 600kN. Design a suitable splice. [14M]

7 Design a welded plate girder 24m in effective span and simply supported at the two ends. It carries a uniformly distributed load of 100kN/m. [14M]

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Code No: RT32013 **R13** SET - 3

III B. Tech II Semester Regular/Supplementary Examinations, April - 2017
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
Use of IS: 800-2007 and Structural (steel) tables are allowed. For all designs adopt Limit State Method

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PART –A

1 [28M]

Design a Gantry girder to be used in a work shop, when columns are placed at 8 m centers. Given
a) Crane capacity: 125 kN, b) weight of crab: 40 kN
c) weight of crane excluding crab: 150 kN, d) wheel base: 3.5 m
e) minimum clearance between centre of crane girder and travel is 1.2 m
f) center to center of crane girders: 22 m
Check the suggested section for bending stresses and Draw the section showing details.

2 Design the base plate for a column ISHB 350@724 N/m carrying a load of 600 kN and a bending moment of 1000 kN-m. It is to be supported on a concrete pedestal having the permissible bearing pressure of 4.2 MPa. Also design the concrete base, if the bearing capacity of soil is 300 kN/m^2. [28M]
Draw to scale the cross-section of the column and sectional elevation of the base plate of the column.

PART -B

3 a) What are the advantages of welded connections? [8M]
Explain the following for fillet weld considering I.S specification;
i) size of weld, ii) Throat thickness and iii) Length of weld
b) With neat sketches explain different types of welds. [6M]

4 Design a simply supported beam of span 6 m and it has to carries a factored UDL of 30 kN/m (excluding the self-weight). The beam is laterally supported throughout. Use f_y = 250 MPa. [14M]

5 Design the principal tie member to carry a tensile force of 40 kN. The panel length is 3 m. Design the connection. Apply the slenderness check. [14M]

6 Design an I–section purlin to support A.C sheet roof. Thepurloins are 1.5 m apart over roof trusses spaced 5 m c/c. The roof surface has an inclination of 20 degrees to the horizontal. The weight of A.C. sheet is 0.3 kN/m^2. The wind load on the roof surface normal to the roof is 2.0 kN/m^2. [14M]

7 . Design a bridge compression member of two channels toe-to-toe. The Length of the member is 8 m. It carries a load of 1300 kN. The width over back of channel is 400 mm, if the channels are connected by lacing system, design the lacing system. [14M]

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Code No: RT32013 **R13** SET - 4

III B. Tech II Semester Regular/Supplementary Examinations, April - 2017
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
Use of IS: 800-2007 and Structural (steel) tables are allowed. For all designs adopt Limit State Method

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PART –A

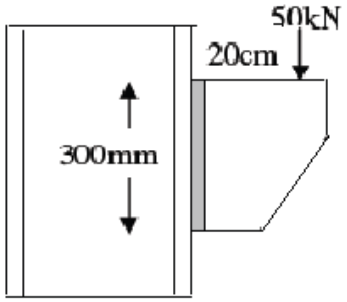
1 A riveted Plate Girder with a superimposed load of 100 kN/m for an effective span of 20 m. Assume girder is to be laterally supported through. Steel is of grade fy=250 MPa. Assume 4-unequal angle sections and available thickness of plates are 12 mm and 16 mm. Design the cross-section of the girder and the bearing stiffener. Draw the cross-section, sectional elevation including bearing stiffener details to a suitable scale. [28M]

2 Design a built-up column 7 m long to carry a factored axial load of 1000 kN. The column is restrained in position but not in direction at both the ends. Design the column with two channels placed toe-to-toe. Provide single lacing system with **welded** connection. Assume Fe 410 grade.Draw to scale the cross-section and sectional elevation of the column. [28M]

PART -B

3 a) Write about the methods for inspecting welds. [5M]

b) Determine the depth of the fillet weld required to join a plate bracket with flange of a stanchion as shown in figure (Load = 50 kN) [9M]



4 Design a suitable rolled steel joist for a roof of a hall 7.5 m x 12 m consists of 100 mm thick RC slab supported on steel beams spaced at 3 m apart. The finishing may be taken as 1 kN/m^2 and live load is taken as 4 kN/m^2. Self-weight of beam is taken as 1 kN/m^2. Take limiting deflection = span/250. [14M]

5 Design a channel section purlin on a sloping roof truss with the dead load of 0.20 kN/m^2 and a live load of 2 kN/m^2 and also a wind load of 1.5 kN/m^2. The purlins are spaced 2 m apart and of span 4 m c/c, simply supported on a rafter at a slope 20 degrees. [14M]

6 a) Write about different types of tension members.

b) Design a tension member to carry a load of 280 kN. The two angles placed back toback with long legs out standing are desirable. The length of the member is 2.9m.

7 A column of 6 m effective length is carrying an axial load of 400 kN and a bending moment of 50 kN-m. The bearing pressure from the concrete pedestal may be taken as 4000 N/m^2. Design a suitable base plate. [14M]

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Code No: RT32013 **R13** SET - 1

III B. Tech II Semester Supplementary Examinations, November/December-2016

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

Use of IS: 800-2007 and steel tables are allowed. For all designs adopt Limit State Method

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PART –A

1 Design an 18m long simply supported welded plate girder carrying a uniformly distributed load of 50kN/m excluding self weight and two concentrated loads of 350kN each at quarter points of the span. Assume that girder is laterally supported throughout. Draw to scale i) the cross-section, ii) the longitudinal views. [28M]

2 Design a beam of effective span 6.0m and subjected to a bending moment of 105.3×10^6Nmm.The compression flange is laterally unsupported throughout. Check for deflections and shear. Assume fy =250MPa. Draw to scale the cross-section, the longitudinal section and place. [28M]

PART –B

3. Design a splice for tension member sections 160 x 10mm and 250 x 14mm the member is subjected to a pull of 200kN. Assume fy=250N/mm^2. [14M]

4. a) Explain the live load and dead loads criteria considerations in the roof trusses. [7M]

   b) Explain the design procedure of simple roof truss. [7M]

5 A column section ISHB 350@ 0.674kN/m is carrying an axial load of 1000kN. It is to be supported over a column section ISHB 450 @ 0.872kN/m. Design the column splicing. [14M]

6. Explain the design procedure of gantry girders. [14M]

7. Design a slab base for a column consisting of ISHB 300 @58.8kg/m and carrying an axial load of 1000kN. Take allowable bearing pressure on concrete as 4N/mm^2. [14M]

Code No: RT32013 **R13** SET - 1

III B. Tech II Semester Regular Examinations, April - 2015
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
Use of IS:800:2007; IS 875:1987(PART-3); IS 1384:1985; Steel tables is allowed.

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PART –A

1 Design a simply supported plate girder of span 15 m carrying a factred u.d.l. of 48 kN/m, using only end stiffeners. Assume compression flange is laterally supported. Draw to scale the cross section and longitudinal section. [28M]

2 Design a gantry girder to carry an overhead electrically operated crane for the following data: Span of gantry girder=6.0m, span of crane girder =18m, crane capacity =200kN, self weight crane girder=180kN, self weight of trolley=75 kN, Minimum hook approach=1.0 m, Distance between wheels=3.5m, self weight of rails=0.3kN/m, Draw to scale the cross section and longitudinal section. [28M]

PART -B

3 A tie member consisting of an ISA 80x50x8 section of Fe410 grade steel is welded to a 12mm thick gusset plate at site. Design welds to transmit load equal to the design strength of the member. [14M]

4 Determine the design bending strength of ISLB 350at 486N/m considering the beam to be laterally unsupported. The design shear force is less than the design shear strength. The unsupported length of the beam is 3.0m. Assume steel of grade Fe410. [14M]

5 Determine the design loads on the purlins of an industrial building near visakhapatnam, given : Class of building: General with life of 50 years, Terrain category 2. Maximum dimension =40m, width of building=15m, Height at eve's level=10m, Topography= θ less than 3^0, permeability= medium, span of truss = 16 m, pitch=1 in 5, sheeting = A.C. sheets, spacing of purlins= 1.35m, spacing of truss=4m. [14M]

6 Design a built up column of the effective length of 5m to carry an axial load of 900kN using lacing. Design the connections using fillet welds. The grade of the steel is E250. [14M]

7 Design a slab base for a built up column consisting of 2 MC 250 placed back to back separated by a distance of 160mm. The factored axial load on the column is 1200kN. [14M]

Code No: RT32013 **R13** SET - 2

III B. Tech II Semester Regular Examinations, April – 2016
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
Use of IS:800:2007; IS 875:1987(PART-3); IS 1384:1985; Steel tables is allowed.

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PART –A

1 A column is made of one ISHB 300 @ 58.8 kg/m one plate 400mm × 12mm symmetrically placed on each flange. The column thus measures 324mm × 400mm overall dimensions. The column carries an axial load of 1800kN. The column is to be provided with a gusseted base resting on concrete base. Design the gusseted base giving full details of the connections. Take safe compressive stress on concrete as 30MPa. Draw to scale Plan and Elevation. [28M]

2 Design a gantry girder for an industrial building to carry an hand operated traveling crane with the following data. Crane capacity is 300 kN. Weight of crane excluding crab is 250 kN. Weight of crab is 6 kN. Span of crane between rails is18 m. Minimum hook approach is1.0 m. Wheel base is 3.0 m. Span of gantry girder is 9 m. Weight of rail section is 30 kg/m. Height of rail section is 75mm. Check the suggested section for bending stresses. Draw to scale the cross section and side view of the girder. [28M]

PART-B

3 a) Classify welds according to the following [7M]
i) According to position ii) According to type
iii) According to type of joint. Explain with neat diagrams.

b) Explain various types of butt welds. Describe procedure for designing a butt weld. [7M]

4 Design a suitable section for a beam of effective span 6m and carrying a superimposed load of 30kN/m including its self weight. Assume that the compression flange is fully restrained against lateral buckling. Apply necessary checks. [14M]

5 a) Explain Euler's formula for buckling of column. Define ideal column. Differentiate columns based on their buckling load for different edge conditions. [7M]

b) What is a column splice? Give various arrangements of providing column splicing. Discuss the design procedure of column splice. [7M]

6 Design the stiffener at 3m from the end of a plate girder of 15m span. It carries a dead load of 35 kN per meter run and a moving load of 50kN per meter run longer than the span. The web is 160cm × 1.2cm in section. Neglect impact. [14M]

7 Explain importance of purlins in a roof truss. List out various types of purlins and details of the loads acting on purlins and design procedure. [14M]

Code No: RT32013 **R13** SET - 3

III B. Tech II Semester Regular Examinations, April - 2016
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
Use of IS:800:2007; IS 875:1987(PART-3); IS 1384:1985; Steel tables is allowed.

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PART –A

1 Design a suitable section for a simply supported gantry girder for the following data. Spacing of columns = 4m. Crane capacity = 160kN. Weight of the crane excluding the crab = 250kN. Weight of the crab = 60kN. Minimum clearance of cross travel = 0.8m. Wheel base = 4.2m. Centre to centre distance between gantry girders = 20m. Height of the rail = 105mm. Expected number of stress cycles = $2x10^6$. Grade of the steel = E250. Draw neat sketch of elevation of gantry girder with loads, cross section of gantry girder. [28M]

2 Design a welded simply supported plate girder for a span of 28m. The girder is loaded with a uniformly distributed load of the intensity 40kN/m due to dead and live loads. Consider the steel grade as E250. Draw cross section of plate girder and end portions of the plate girder. [28M]

PART –B

3 A tie member consists of two ISMC 250. The channels are connected on either side of a 12mm thick gusset plate. Design the welded joint to develop the full strength of the tie. However the overlap is to be limited to 400mm. [14M]

4 Design a simply supported beam of span 4 m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 20kN/m imposed load and 20 kN/m dead load (section is stiff against bearing). Assume Fe 410 grade steel. [14M]

5 Determine the tensile strength of a roof truss member consisting of 2 ISA 90 × 60 × 6 mm connected on either side by long legs to a gusset plate 8 mm thick by 4mm welds over an effective weld length of 200 mm. [14M]

6 An upper storey column ISHB 300 @ 577 N/m carries a factored load of 1200 kN and a factored moment of 12 kN-m. It is spliced with a lower storey column ISHB 400 @ 806 N/m. Design a suitable splice. [14M]

7 Design a gusseted base for a built up column consisting of 2 MC 250 placed back to back separated by a distance of 160mm. The factored axial load on the column is 1200kN. [14M]

Code No: RT32013 **R13** SET - 4

III B. Tech II Semester Regular Examinations, April - 2016
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
Use of IS:800:2007; IS 875:1987(PART-3); IS 1384:1985; Steel tables is allowed.

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PART –A

1 Design a welded plate girder to carry a superimposed load of 50kN/m and two concentrated loads of 200kN each at one third points of the span. The effective span of the plate girder is 24m. Assume that the girder is laterally supported throughout its length. The yield strength of the steel of both the flanges and the web is 250MPa. Draw cross section of plate girder and end portions of the plate girder. [28M]

2 Design a gusseted base to carry an axial factored load of 3000 kN. The column is an ISHB 450 @ 855 N/m with two 250×22 mm cover plates on either side. The effective height, of column is 5 m. The column is to rest on a M20 concrete pedestal. Draw to scale the plan and elevation. [28M[

PART -B

3 Design a suitable longitudinal fillet weld to connect 120x8mm plate to 150x10mm plate to transmit a pull equal to the full strength of small plate. Assume welding is to be made in the field. [14M]

4 Design a laterally unrestrained beam to carry a uniformly distributed load of 30kN/m. The beam is unsupported for a length of 3m and is simply placed on longitudinal beams at its ends. [14M]

5 Determine the tensile strength of roof truss diagonal of 150×75×10mm connected by its long lag to a gusset plate 8mm thick by 6mm welds. Adopt f_y = 250 MPa. [14M]

6 Design a welded laced column of effective length 8 m to carry a factored axial load of 1000 kN using two channels placed back to back. Provide a single lacing system. [14M]

7 Calculate the design load carrying capacity in compression of discontinuous strut 3.m long consisting of two angle section 75×75×10 mm for: [14M]
i) Connected to the same side of a gusset plate 8mm thick
ii) Connected to both sides of 8mm thick gusset plate.
With welds of 8mm size Adopt f_y = 250 MPa.

Code No: **R32013** **R10** **Set No. 1**

III B.Tech II Semester Supplementary Examinations, Dec - 2015
DESIGN & DRAWING OF STEEL STRUCTURES
(Civil Engineering)

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

Answer any ONE Question from Part – A
and any THREE Questions from Part – B

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PART-A (30 M)

1 A simply supported plate girder of 15m is subjected to a maximum factored moment of 4000 kN-m and a factored shear force of 600kN, using end stiffeners. Design the cross section of the girder and end bearing stiffeners. Check for bending moment. Draw the cross-section, longitudinal section including bearing stiffeners details to a suitable scale.

2 Design a gusseted base to carry an axial factored load of 3000kN. The column is ISHB 450@ 855N/m with two 250mm×20mm cover plates on either side. The effective height of column is 5m. The column is to rest on M20 concrete pedestal.

PART-B (3x15=45M)

3 a) Explain the various types of fillet welds with neat sketches.
b) An ISA 65x65x10 carries a tensile load of 200 kN, applied along its centroidal axis. This angle is to be welded to a gusset plate. Find out the lengths of side fillet welds required at the heel and toe of the angle.

4 Design a compression member of two channels placed toe-to-toe. The length of the compression member is 10m and carries a load of 1200 kN. The width over the backs of channels is 450mm. The channels are connected by battens. Sketch the c/s of the column.

5 Design I-section purlin for an industrial building to support a galvanized corrugated iron sheet for the following data:
Spacing of the trusses = 6m, Inclination of main rafter = 30^0, spacing of purlin = 1.5m, Weight of corrugated sheeting = 130 N/m^2, live load 0.6kN/m^2, wind load = 1.8kN/m^2 and yield stress of steel = 250 Mpa.

Code No: **R32013** **R10** **Set No. 1**

6 Design a simply supported gantry girder to carry an electric overhead travelling crane, given: (i) Span of gantry girder = 6.5m, (ii) Span of of crane girder = 16m, (iii) Crane capacity = 250kN, (iv) Self weight of crane girder excluding trolley = 200kN, (v) Self weight of trolley =50kN, (vi) Minimum hook approach = 1.0m, (vii) Distance between wheels = 3.5m and (viii) Self weight of rails = 0.3kN/m.

7 Design a built up column composed of two channel sections placed back to back, carrying on axial load of 1500 kN. The effective length of the column is 7 m. Also design a single Lacing system.

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