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

III B. Tech II Semester Regular/Supplementary Examinations, April -2018

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 : 1) IS 800 – 2007 2) IS 875 –steel table 3) Part III (wind loads)

For all designs adopt Limit State Method

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PART –A

1 Design a welded plate girder of 20 m span using the tension field action for the following factored forces. [28M]

Maximum moment, M_z = 5000 KNm

Maximum shear force = 900 KN

The girder is laterally restrained. Connections need not be designed.

Draw to scale the longitudinal and cross section for the welded plate girder showing all the details

2 A column ISHB 350 @ 661.2 N/m carries an axial compressive factored load of 1700 KN. Design a suitable welded gusset base. The base rests on M 20 grade of concrete. Draw to scale the plan, elevation and sectional elevation showing the details of welded gusset base including connections. [28M]

PART -B

3 a) Explain various types of welding processes with neat diagrams. [14M]

b) List out and explain various advantages and disadvantages of welded connections over riveted connections.

c) Classify welds according to the following:
i) According to position ii) According to type of joint. Explain with neat diagrams.

4 Design a slab base for a column ISHB 350 @ 710.2 N/m subjected to an factored axial compressive load of 1500 KN for the following conditions [14M]
i) Load is transferred to the base plate by direct bearing of column flanges.
The base rests on concrete pedestal of grade M 20. Draw a neat sketch showing all the details.

5 Design a simply supported beam of span 6m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 30 KN/m imposed load and 30 KN/m dead load (section is stiff against bearing). Assume Fe 410 grade steel. [14M]

6 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. Provide single lacing system with welded connections for channels back to back. [14M]

7 a) What are the reasons for using welded connections? [14M]

b) Explain about types and properties of welds with neat sketches.

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

III B. Tech II Semester Regular/Supplementary Examinations, April -2018

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 : 1) IS 800 – 2007 2) IS 875 –steel table 3) Part III (wind loads)

For all designs adopt Limit State Method

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PART –A

1 Design a column of effective length 5.9 m. It is subjected to a factored axial compressive load of 2000 KN. Provide two channels back to back connected with battens by site welded connection. Use steel of grade Fe 410. Draw to scale the plan and elevation showing all the details. [28M]

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 exclusive of self weight. Design the girder without intermediate transverse 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. Also draw to scale the Elevation and cross section. [28M]

PART –B

3 Design a laterally unsupported beam for the following data. [14M]
Effective span: 4m
Maximum bending moment: 550 KNm
Maximum shear force: 200kN
Steel grade: Fe 410

4 A column section ISHB 350 @ 661.2 N/m carries a factored axial compressive load of 1650 KN and factored bending moment of 90 KNm. Design the base plate and its connections. Assume concrete pedestal of M 20 grade. [14M]

5 What is lacing. Explain with neat sketches various types of lacings and their arrangement. Describe procedure of designing lacing. [14M]

6 Explain about the procedure for the design of tension members as per IS code recommendations. [14M]

7 Design a channel purlin for an industrial building located at Guwahati with a span of 20 m and a length of 50 m. The roofing is galvanized iron sheeting. Basic wind speed is 50 m/s and the terrain is an open industrial area. Building is class B building with a clear height of 8 m at eaves. [14M]

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

III B. Tech II Semester Regular/Supplementary Examinations, April -2018

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 : 1) IS 800 – 2007 2) IS 875 –steel table 3) Part III (wind loads)

For all designs adopt Limit State Method

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PART –A

1 Design a gantry girder to be used in an industrial building carrying a manually operated overhead travelling crane, for the following data: [28M]

Crane capacity	200 KN
Self-weight of crane girder excluding trolley	200 KN
Self-weight of the trolley, electric motor, hook, etc.	40 KN
Approximate minimum approach of the crane hook to the gantry girder	1.2 m
Wheel base	3.5 m
c/c distance between gantry rails	16 m
c/c distance between columns (span of gantry girder)	8 m
Self-weight of rail section	300 N/m
Diameter of crane wheels	150 mm

Steel is of grade Fe 410. Design only the section and check for moment capacity. Draw to scale the longitudinal section and cross section.

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 exclusive of self weight. Design the girder with intermediate transverse 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 need not be designed. Use post critical method for the design. Draw to scale the elevation and cross section showing all the details of reinforcement. [28M[

PART -B

3 Design a laterally supported beam of effective span 6 m for the following data. [14M]
Steel grade: Fe 410
Maximum bending moment: 150 KNm
Maximum shear force: 210 kN
Check for deflection is not required.

4 What is a batten? Explain with neat sketches various types of battens and their arrangement. Describe procedure of designing a batten system. [14M]

5 A column in an industrial building has to carry a total axial load of 2000 KN. Its length is 6m, and is effectively restrained in position as well as direction at both the ends. Design a double I section with plates on both sides for the column and a slab base for foundation. Take safe compressive stress on concrete as 30MPa. [14M]

6 Design a base plate for an ISHB 350 column to carry a factored load of 1200 KN. Assume Fe 410 grade steel and M 25 concrete. [14M]

7 Explain procedural steps involved in design of a roof truss for an industrial building. List out various loads acting and their combinations so as to produce critical loading conditions for the truss. [14M]

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

III B. Tech II Semester Regular/Supplementary Examinations, April -2018

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 : 1) IS 800 – 2007 2) IS 875 –steel table 3) Part III (wind loads)

For all designs adopt Limit State Method

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PART –A

1 Design a welded plate girder for a simply supported bridge deck beam with clear span of 20 m, subjected to the following. [28M]
DL including self weight = 20 KN/m
Imposed load = 10 KN/m
Two moving loads = 150 KN each spaced 2 m apart
Assume that the top compression flange of the plate girder is restrained laterally and prevented from rotating. Use mild steel with f_y = 250 MPa. Design as an unstiffened plate girder with thick webs. Draw to scale the longitudinal section and cross section.

2 Design a stiffened seat connection to join ISMB 350 @ 514 N/m with a column section ISHB 300 @ 576.8 N/m. The beam transmits an end reaction of 320 KN due to factored loads. Steel is of grade Fe 410. Draw the longitudinal and sectional elevation of the joint. [28M]

PART -B

3 Design a steel beam section for supporting roof of a big hall for the following data and apply the usual checks. Assume steel of grade Fe 410. [14M]
Clear span: 6.5m
End bearings: 150mm
c/c spacing of beams: 3m
Imposed load on the beam: 10 KN/m^2
Dead load inclusive of self weight: 4 KN/m^2
Restriction on beam depth: 375 mm
The compression flange of beam is laterally supported throughout.

4 A column section ISHB 300 @ 618 N/m is to be spliced. The factored design loads are axial load over the column is 450 KN, shear force is 100 KN and bending moment is 30 KNm. Design the splice plates and a butt weld for the column section. Use steel grade of Fe 410. [14M]

5 A column section ISHB 350 @ 661.2 N/m carries a factored axial compressive load of 1650 KN and factored bending moment of 180 KNm. Design the base plate and its connections. Assume concrete pedestal of M 20 grade. [14M]

6 Design an I – section purlin, for an industrial building situated in outskirts of Allahabad, to support a galvanized corrugated iron sheet roof for the following data. [14M]
Spacing of the truss c/c = 6 m
Span of truss = 12 m
Spacing of purlins c/c = 1.5 m
Intensity of wind pressure = 2 KN/m^2
Weight of galvanized sheets = 130 N/m^2
Steel grade = Fe 410

7 An ISA 100 mm x 100 mm x 6 mm (f_y = 250 N/mm^2) is used as a strut in a truss. The length of the strut between the intersections at each end is 3 m. Calculate the strength of the strut if it is welded at each end. [14M]

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