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

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## PART –A

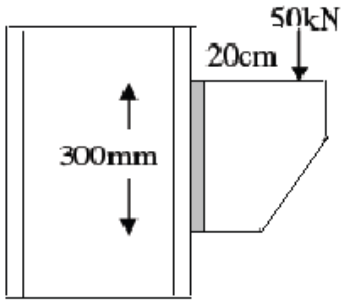
1 A riveted Plate Girder with a superimposed load of 100 kN/m for an effective span of 20 m. Assume girder is to be laterally supported through. Steel is of grade fy=250 MPa. Assume 4-unequal angle sections and available thickness of plates are 12 mm and 16 mm. Design the cross-section of the girder 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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