Code No: R1632011 **R16** SET - 1

III B. Tech II Semester Regular Examinations, April/May - 2019

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 (Part III)-1987, structural steel tables is to be permitted in the examination hall.

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PART –A

1 Design a welded plate girder 24 m in span and laterally restrained. 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 Fe415. Yield stress of steel may be assumed to be 250 MPa irrespective of the thickness plates used. Design cross section, connection and the end load bearing stiffener. Sketch to a scale the longitudinal section and cross section of the girder and typical arrangement of stiffeners. [28M]

(OR)

2 Design a gantry girder for an industrial building to carry an electric overhead traveling crane with the following data. Crane capacity is 300 kN. Weight of crane excluding crab is 200kN. Weight of crab is 5 kN. Span of crane between rails is18 m. Minimum hook approach is 1.0 m. Wheel base is 3.0 m. Span of gantry girder is 9 m. Weight of rail section is 30 kg/m. Assume any missing data. Draw to scale the cross section and longitudinal section. [28M]

PART -B

3 a) Explain the various types of fillet welds with neat sketches. [4M]

b) An ISA 55x55x10 carries a tensile load of 180 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. [10M]

4 Explain the difference in performance of laterally unrestrained beams and restrained beams with neat diagrams. Explain design procedure. [14M]

5 An upper storey column ISHB 300 @577N/m carries a factored load of 1200kN and a factored moment of 12kN-m. It is to be spliced with lower storey column ISHB400@806N/m. Design a suitable splice. [14M]

6 Design a channel section purlin without sag bars for a trussed roof from the following data: [14M]
Span of roof = 12*m* Spacing of purlin along slope = 2*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

7 Design the suitable slab base for a column having one and two cover plates of 350 mm x 25 mm. The column carries an axial load of 2400 kN. Assume the permissible baring stress for slab base as 1890 kg/cm^2. [14M]

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Code No: R1632011 **R16** SET - 2

III B. Tech II Semester Regular Examinations, April/May - 2019

DESIGN AND DRAWING OF STEEL STRUCTURES

(Civil Engineering)

Time: 3 hours Max. Marks: 70

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PART –A

1 Design a gantry girder for a mill building to carry an electric over head travelling crane having following data: [28M]
Crane capacity = 250 kN
Weight of crane excluding crab = 200 kN
Weight of crab = 60 kN
Span of crane between rails = 20 m
Minimum hook approach = 1.1 m
Wheel base = 3.4 m
Span of gantry girder = 7.0 m
Mass of rail section = 30 kg/m
Height of rail section = 75 mm
Take f_y=250 MPa and E=2X10^5 MPa
Draw cross section and longitudinal section of the girder.

(OR)

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. Draw to scale the plan and elevation. [28M]

PART -B

3 a) What are the advantages and disadvantages of welded connections? [4M]
b) Determine the tensile strength of a roof truss 100 x 75 x 10 mm. The shorter leg is connected to the gusset plate with 20 mm diameter bolts in one row. Number of bolts used is 5. Edge/end distance is 30 mm and pitch of rivets are 55 mm. [10M]

4 A beam of span 8*m* carries a *U D L of* 20 *Kn/m* over the whole length. Design the beam assuming that the compression flange is laterally restrained throughout the length. Take f_y=250N/mm^2. [14M]

5 The main tie of a building roof truss has to carry a maximum axial tension of 200kN. Design a suitable section for the member as per IS specifications. Design the section as two angles placed back to back of a gusset plate. [14M]

6 Design a compression member of two channels placed toe-to-toe. The length of the compression member is 12m and carries a load of 1500kN The width over the backs of channels is 450*mm*. The channels are connected by double lacing. Sketch the cross-section of the column. [14M]

7 Design a welded plate girder of span 24 m to carry a super imposed load of 30 kN/m. Use Fe-415 (E250) grade steel. [14M]

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Code No: R1632011 **R16** SET - 3

III B. Tech II Semester Regular Examinations, April/May - 2019

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 (Part III)-1987, structural steel tables is to be permitted in the examination hall.

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PART –A

1 Design a simply supported plate girder of span 15m carrying a factored super imposed load of 48kN/m, using only end stiffeners. Draw the cross section, longitudinal section including stiffeners details to a suitable scale. [28M]

(OR)

2 Design a built up column consisting of two channels placed toe to toe. The column carries an axial factored load of 16kN. The effective height of column is 10m. Design the lacing also. Draw to a scale the cross section and sectional elevation of the column with lacing details. [28M]

PART -B

3 A welded crane bracket support a load of 120 kN at a distance of 150 mm from the edge of a column, using 15 mm thick plate. Design the connection. Assume any missing data. [14M]

4 Design a slab base for a built-up column consisting of 2 - *MC* 250 placed back to back separated by a distance of160*mm*. The factored axial load on the column is1200*kN*. [14M]

5 a) Explain the procedure to find out compressive stress from IS:800-2007. [4M]

b) Determine the load carrying capacity of a strut made with 2 ISA 100 x 100 x 8 mm back to back if the length of member is 3.6 m and welded to a gusset plate of 10 mm thick. [10M]

6 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. Assume Fe415 grade steel. [14M]

7 Design a simply supported gantry girder to carry an electric overhead travelling crane, given: (i) Span of gantry girder = 6.5m, (ii) Span 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. [14M]

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Code No: R1632011 **R16** SET - 4

III B. Tech II Semester Regular Examinations, April/May - 2019
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

1 A steel column is to take a central load of 1600*kN* is to be built of four equal angles forming a 50*cm*×50*cm* square. The height of the column is to be 6*m* with hinged ends. Design a suitable column section and a lacing system. Draw to scale the plan and elevation. [28M]

(OR)

2 Design a suitable web splice for a plate girder at a section at which the bending moment is 5000 *kN.m* and shear force is 1000 *kN* . The plate girder is built-up from a web plate 2500*mm* deep× 16*mm* and two *ISA* 200*mm*×150*mm*×15*mm* angles and a 600*mm*×16*mm* cover plate in each flange. The long legs of the flange angles are placed horizontally. [28M]
Draw:
(i) The elevation of the web splice showing all the details and
(ii) Cross-section of the plate girder at web splice.

PART -B

3 a) What are the advantages of welded connections? [4M]
b) A tie member of a roof truss consists of 2 ISA 10075, 8 mm. the angles are connected to either side of a 10 mm gusset plates and the member is subjected to a working pull of 300 kN. Design the welded connection. [10M]

4 Design a simply supported beam section of span 4 m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The U.D.L is made up of 20.0 kN/m imposed load and 20 kN/m dead load. Assume Fe415 grade steel. [14M]

5 Design a steel column to carry an axial load of 2000 kN. The length of the column is 5.0 m and effectively held in both ends. [14M]

6 Design a welded plate girder without stiffness and also end bearing stiffness for an effective span of 30 m and carrying a u.d.l of 30 kN/m and two concentrated loads of 150 kN each acting at 10 m from both ends. The girder is simply supported at ends. It is fully restrained at both ends against lateral buckling throughout the span. Take load factor and yield stress as 1.5 and 250 MPa. [14M]

7 Explain step by step procedure to design a gantry girder as per IS code. [14M]

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