Design & Drawing of Steel Structures VTU Question Paper Set

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10CV82

Eighth Semester B.E. Degree Examination, June/July 2015
Design and Drawing of Steel Structures

Time: 4 hrs. Max. Marks:100

Note: *1. Answer ONE question, from Part-A and ONE question from Part-B.*
2. Use of IS:800-2007 and steel table are permitted.

PART – A

1 a. A secondary beam ISLB 450 @ 640 N/m is connected to a main beam ISLB 600 @ 975 N/m with top flanges of the beams at the same level. Two angles ISA 100 × 100 × 8 mm are used for connection 5 bolts of diameter 20mm are used to connect each angle to the web of the main beam, 5 bolts of diameter 20mm are used to connect angles with web of secondary beams:
Draw to a suitable scale:
i) Sectional elevation. **(08 Marks)**
ii) Side view. **(07 Marks)**

b. An upper storey column ISHB300 @ 577 N/m is to be spliced with a lower storey column ISHB400 @ 758.5 N/m. The two column are coaxial. Provide 50mm thick bearing plate and 6mm thick flange splice plate. Use 10 bolts of 20mm diameter on each side of the joint in two lines of 5 bolts each for connecting flanges of the columns to flange splice plate.
Draw to a suitable scale:
i) Sectional elevation. **(08 Marks)**
ii) Side view with details. **(07 Marks)**

2 a. A beam ISMB400 @ 604 N/m is to be connected to the flange of the column ISHB450 @ 907 N/m by means of stiffened connection. Provide top cleat angle ISA 75 × 75 × 6mm and use 4mm fillet weld for connection. Provide 120 × 140 × 16mm bearing plate and stiffening plate 220 × 120 × 12mm. Reduce the width of the stiffening plate to 50mm at the bottom. Use 5mm fillet weld all around for connection.
Draw to a suitable scale:
i) Elevation. **(06 Marks)**
ii) Side view. **(06 Marks)**

b. A gusseted base is to be detailed for a column ISHB 450 @ 855.4 N/m built up with one cover plate of section 250 × 12mm on each flange size of the base plate is 800 × 800 × 20mm. The gusset angles are ISA 150 × 150 × 12mm. The gusset plates are 12mm thick with one plate at each face of the column. Provide 4 bolts of 30mm diameter in 2 rows along one face of column to connect the flange of column, gusset plate and gusset angle. 6 bolts of 20mm diameter, in 2 rows are used to connect gusset plate with each flange of the column. Nominal bolts of 20mm diameter shall be provided for connecting gusset plate and gusset angle on the sides.
Draw to a suitable scale.
i) Plan **(06 Marks)**
ii) Sectional elevation **(07 Marks)**
iii) Side view. **(05 Marks)**

PART – B

3 The centre line of a roof truss is as shown in the Fig.Q.3. The magnitude and nature of forces under service conditions are
Top chord members – 120 kN compression
Bottom tie members – 100 kN tension
Interior member – 60 kN tension and 50 kN compression.
For all the interior members use similar single angle section. Design all the members and use black bolt of grade 4.6 for end connections. Also design a bearing plate and anchor bolts. 4 in numbers for a pull of 60kN to connect the truss to an RCC column 300 × 300 mm of M_{20} grade concrete. **(40 Marks)**

Draw to a suitable scale.

i) Elevation of truss greater than half space. **(10 Marks)**
ii) Elevation of joint C to a larger scale. **(10 Marks)**
iii) Elevation of support A. **(10 Marks)**

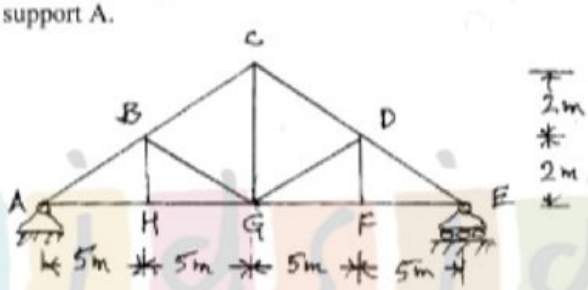

Fig.Q.3

4 Design a simply supported Gantry girder for an industrial shed to support an electric overhead crane using the following data:

Span Gantry girder	- 4m
Crane capacity	- 160 kN
Weight of the crane excluding the crab	- 250 kN
Weight of the crab	- 60 kN
Minimum hook approach	- 0.8m
Wheel base	- 5.3m
Span crane girder	- 20m
Height of the rail	- 105mm

(40 Marks)

Draw to a suitable scale

i) Cross section of gantry girder **(05 Marks)**
ii) Plan details **(10 Marks)**
iii) Elevation. **(15 Marks)**

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Eighth Semester B.E. Degree Examination, June/July 2016
Design & Drawing of Steel Structures

Time: 4 hrs. Max. Marks:100

Note: 1. ***Answer any ONE full questions from each part.***
2. Use IS: 800-2007 and steel table are permitted.
3. Missing data, if any may be suitably assumed.

PART – A

1 a. A cross beam ISLB-350 @ 495 N/m is connected to a main beam ISMB-500 @ 869 N/m. The top of the flanges are at same level. The framed connection has the following details:
i) Frame angle – 2 ISA 150×115×10 @ 200 N/m.
ii) The connection between the cleat angle leg of 115 mm and web of the cross beam is 5 mm fillet weld of length 250 mm.
iii) The connection between the cleat angle leg of 150 mm and web of the main beam is 8 mm fillet weld of length 250 mm.
iv) The clearance between cross beam and web of main beam is 10 mm.
Draw to a suitable scale:
- Front view and
- Side view with all details. **(15 Marks)**

b. The design stiffened seated connection has the following details:
i) ISHB-300@630 N/m transmits an end reaction of 80 kN to the flange of column section ISHB-250 @ 547 N/m.
ii) Seat angle ISA 100×75×8 mm at 105 N/m, 100 mm along horizontal.
iii) Stiffening angle 2ISA 90×90×8 mm at 108 N/m.
iv) Cleat angle at top ISA 75×75×8 mm at 89 N/m. Connect 2 – 18 mm dia in each leg.
v) Bolts connecting the stiffening angle with the column flange are 8 – 20 mm dia. HSFG bolts at a pitch of 60 mm C/C, 4 bolts in each row.
vi) Stiffening angle are tack bolted.
Use 2 – 18 mm dia bolts.
Draw to a suitable scale:
- Front elevation
- Side view. **(15 Marks)**

2 a. A built up column is composed of 2ISLC-350@388 N/m placed back to back at clear distance of 220 mm. The column is provided with single lacing system consisting of 60 ISF12 mm at 45° and is connected by a 20 mm dia bolt at each end. The channels are supported over a slab base 600×450×50 mm. The angles connecting column and base plate is ISA 100×100×10 mm and are connected by 2-20 mm dia on each leg. Draw to a suitable scale:
i) Sectional elevation. ii) Plan of slab base assembly with all details. **(15 Marks)**

b. Draw to a suitable scale the elevation and plan of the column splice having the following details:
i) Bottom column : ISHB – 300 @ 630 N/m ii) Top column : ISHB – 200 @ 400 N/m
iii) Splice plate : 8 mm thick iv) Bearing plate : 50 mm
v) Use 8 – 20 mm dia on each side of the joint in two rows of 4 bolts each for connecting flanges of the columns to flange splice plate.
Draw to a suitable scale :
- Sectional elevation
- Side view with details. **(15 Marks)**

PART – B

3 A simply supported welded plate girder for an effective span of 30 m and a udl of 30 kN/m and 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 stiffner. 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. **(40 Marks)**

Draw to a suitable scale:

a. Elevation for full span with discontinuous line. **(10 Marks)**

b. C/S at support and midspan. **(10 Marks)**

c. Plan for full span with discontinuous line. **(10 Marks)**

4 Design a simply supported crane girder for the following data. The girder is electrically operated. Take yield stress of steel is 250 N/mm^2. Use 16 mm dia. Bolts of grade 4.6.

i) Capacity of crane : 250 kN
ii) Weight of crab (Trolley) : 80 kN.
iii) Weight of crane girder excluding trolley : 300 kN
iv) Span of the crane girder = 18 m.
v) Minimum hook approach = 1.0 m
vi) Wheel base = 3.0 m
vii) Span of gantry girder = 6 m
viii) Weight of rail section = 0.25 kN/m
ix) Take f_y = 250 MPa. **(40 Marks)**

Draw to a suitable scale showing all details:

a. Plan of G.G. **(05 Marks)**

b. Front view **(10 Marks)**

c. Cross section of Gantry Girder. **(15 Marks)**

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Eighth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Design & Drawing of Steel Structures

Time: 4 hrs. Max. Marks:100

Note: 1. ***Answer any ONE full question from Part A and One full question from Part B.***
2. ***Use of IS 800-2007, SP(6)(1) – 1984 or steel tables is permitted.***

PART – A

1 a. A beam of ISMB 400 @ 61.6 kg/m is connected to the flange of a stanchion ISHB 400 @ 77.4 kg/m by framed connections using 2 ISA 90×90×8 mm angles. Five bolts of 20 mm dia are used to connect the angles and web of ISMB 400 @ 61.6 kg/m 12 bolts of 20 mm dia are used to connect the angle and column ISHB 400 @ 77.4 kg/m. Draw to a suitable scale:
i) Sectional plan
ii) Any two views showing cross section details. **(15 Marks)**

b. Draw to a suitable scale elevation (front view) and end view (side view) of a beam column connection for an exterior column at the floor level in a steel framed structure if the column is ISHB 200, b_f = 200 mm, t_y = 9.0 mm, t_w = 6.5 mm. Three beams of ISLB 350, b_f = 165 mm, t_y = 11.4 mm, t_w = 7.4 mm. Web cleat angle is ISA 75×75×8 mm of suitable length. Adopt 16 mm bolts, suitable numbers judicially. **(15 Marks)**

2 a. Draw the front elevation and side elevation to a column splicing arrangement for the following data:
i) Column→ ISHB 300 @ 58.8 kg/m
ii) Cover plates → 420×250×6 mm
iii) Bolts – 20 ϕ @ 70 mm C/C
iv) Web splice plate – 12 mm thick. **(10 Marks)**

b. A column base connection for axially loaded is to be made for the following data:
i) Base plate → 900×600×25 mm
ii) Column → one no. ISHB 300, bf = 300 mm, ty = 12 mm, tw = 7.5 mm
iii) Web cleat → 2 nos. ISA 80×80×8, 250 mm long
iv) Gusset plates → 2 nos. 900×600×12 mm (suitably tapered)
v) Flange cleat → 2 nos. ISA 80×80×8, 900 mm l mg
vi) Bolts → 16 mm ϕ
Choose suitable pitch and number of bolts. Also show 4 –holding down bolts of 25 mm ϕ. Draw the elevation (front), side view and plan (top view) of the above members connected suitably. **(20 Marks)**

PART – B

3 Design a welded plate girder of span 24 mt, carrying super imposed load of 50 kN/m and two concentrated loads of 200 kN each at one third points of the span. Assume the girder as laterally supported throughout and yield strength = 250 MPa. Provide two curtailments. **(40 Marks)**

Draw to a suitable scale:
i) Plan for full span (sectional)
ii) Elevation (front)
iii) Cross section at support and midspan. **(30 Marks)**

4 Design a simply supported crane Gantry girder for the following data:

i) Span of crane girder = 20 m
ii) Span of Gantry girder = 7 m
iii) Capacity of the crane = 220 kN
iv) Self wt. of crane excluding the crab = 200 kN
v) Wt. of crab = 60 kN
vi) Wheel base distance = 3.4 m
vii) Minimum hook approach = 1.10 m
viii) Self wt. of rail = 0.3 kN/mm
ix) Height of rail = 70 mm **(40 Marks)**

Draw to a suitable scale:

- Plan details
- Side elevation.
- Section through the Gantry. **(30 Marks)**

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Eighth Semester B.E. Degree Examination, June/July 2014
Design and Drawing of Steel Structures

Time: 4 hrs. Max. Marks:100

Note: *1. Answer ONE full question from Part – A, ONE question from each Part – B.*
2. Use of IS 800 : 2007 Steel tables and SP6(1) is permitted.

PART – A

1 a. A secondary beam ISMB 300 @ 433.6 N/m is to be jointed to the main beam ISMB 400 @ @ 604.3 N/m. Two angles ISA 90 × 90 × 6 are used for connection. Three bolts of diameter 20 mm used to connect angle to the web of ISMB 300. 6 bolts of 20 mm diameter are used to connect the angles to the web of ISMB 400. The flanges of both beams are at the same level. Draw to a suitable scale.
i) Sectional elevation ii) side view showing all details. **(16 Marks)**

b. An ISHB 400 @ 759.3 N/m in the lower storey of a building is connected to ISHB 350 @ 661.2 N/m of upper storey. The thickness of bearing plate is 34 mm. The thickness of splice plate is 8 mm. Use suitable filler plate for top column. 6 numbers of 16 mm diameter ordinary bolts are provided for connecting each of column flange with splice. Plate for lower storey column and 6 numbers of 16 mm diameter bolts are provided for connecting each of column flange with splice and filler pate for upper storey column and 2 bolts for connecting only flange and filler plate. Assume pitch of bolts as 60 mm. Draw to a suitable scale :
i) Elevation
ii) Side view. **(14 Marks)**

2 a. Draw to a suitable scale, beam to column stiffened seat connections :
i) front view showing c/s of beam
ii) side view showing elevation of beam for the following details :
Column – ISHB 400 @ 82.2 kg/m (806.4 N/m)
Beam – ISMB 400 @ 6.6 kg/m (604.3 N/m)
Seat angle - ISA 100 × 100 × 10 mm
Cleat angle – ISA 90 × 90 × 8 mm
Pair of stiffeners – 2 – ISA 90 × 90 × 8, 8 – 20 mm bolts for stiffeners to column in two rows, two – 20 mm bolts for remaining connection. **(15 Marks)**

b. Following are the details of gusseted base :
i) Built up column : 2 – ISWB – 400 @ a spacing of 325 mm between webs
ii) Size of base plate : 600 mm × 750 mm
iii) Thickness of base plate : 28 mm
iv) Gusset angles ISA 150 × 100 × 12 with longer leg connected to gusset plate
v) Thickness of gusset plate : 12 mm
vi) 16 bolts of 20 mm dia connect gusset angles to gusset plate, 16 bolts of 20 mm dia connect gusset angles to the column
vii) Anchor bolts 20 mm - ϕ - 4 no
Draw to a suitable scale :
i) Elevation showing flanges of column
ii) Sectional plan. **(15 Marks)**