Reg. No. :

Question Paper Code : 71587

20/05/2017 FN

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Sixth Semester

Civil Engineering

CE 6603 — DESIGN OF STEEL STRUCTURES

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Use of IS 800 – 2007 IS 875 – Part 3 and Steel Tables is permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define nominal diameter of rivet.
2. What is meant by pitch of rivet?
3. What are the various types of tension members?
4. What is net sectional area?
5. What is meant by a strut?
6. What are the assumptions made in Euler's analysis?
7. What is meant by slender section?
8. What are the classifications in stiffeners?
9. Draw neat sketches of various types of roof trusses.
10. List the various forces acting on a gantry girder.

PART B — (5 × 16 = 80 marks)

11. (a) A tie member 75 mm × 8 mm connected to a 10 mm thick gusset plate is to transmit a load of 90 kN. Design the fillet weld and calculate the necessary over lap. Assume site welding.

Or

(b) A single bolted double cover butt Joint is used to connect two plates of 8 mm thickness. Assuming 20 mm bolts at 50 mm pitch, calculate the efficiency of the joint. The thickness of cover plate is 4 mm.

12. (a) Determine the tensile strength of a roof truss diagonal 100 × 75 × 10 mm connected to the gusset plate by 4 nos. of 20 mm diameter power driven rivets in one row along the length of the member. The short leg of the angle is kept outstanding.

Or

(b) A bridge truss diagonal carrier an axial bull of 300 kN. Two mild steel flats 250 ISF 10 and ISF 18 of the diagonal are to be joined together. Design a suitable splice.

13. (a) Design a built up column 6 m long to carry a load of 400 kN. The column is restrained in position but not in direction at both the ends. Provide single angle lacing system with bolted connections.

Or

(b) A built up column consists of ISHB 400 @ 77.40 kg/m with one 300 mm× 12 mm flange plate on each side. The column carries an axial load of 2600 kN. Design a gusseted base if the column is supported on concrete pedestal with a bearing pressure of 5 N/mm².

14. (a) Design a laterally restrained simply supported beam to carry a uniformly distributed load of 44 kN/m. The effective span of the beam is 8 m. A bearing length of 75 mm is provided at the supports.

Or

(b) Design a rolled steel I section for a simply supported beam with a clear span of 6 m. It carries a U.D.L. of 50 kN/m exclusive of self weight of the girder. The beam is laterally unsupported.

15. (a) Design a purlin for a roof truss having the following data :

Span of the truss = 6 m

Spacing of the truss = 3 m c/c

Inclination of the roof = 30

Spacing of purlin = 2 m c/c

Wind pressure = 1.5 kN/m²

Roof coverage = A.C sheeting weighing 200 N/m²

Provide a channel section purlin.

Or

(b) (i) List out various elements of the roof truss and give their design requirements. (8)

(ii) Explain the design principles of Gantry Girder. (8)

Reg. No. :

Question Paper Code : 40814

4/05/18 FN

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Sixth Semester
Civil Engineering
CE 6603 – DESIGN OF STEEL STRUCTURES
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Formulate the equation for calculating the effective throat thickness of weld.
2. Illustrate the advantages of HSFG bolts.
3. When gusset plates are used ?
4. Classify the modes of failure in Tension member.
5. State the purpose of column base.
6. Evaluate the effective length of column based on end conditions.
7. What is laterally unsupported beam ? Give an example.
8. Write the formula for calculating the thickness of beam bearing plate.
9. What is the purpose of the purlin in a roof truss ?
10. Calculate the Design wind speed for Dehradun and Chennai.

PART – B **(5×13=65 Marks)**

11. a) Find the dimensions of a doubly bolted lap joint for plates 16 mm thick to carry its full load. Take permissible axial tension in plate 150 N/mm².

(OR)

b) Find the safe load and efficiency of a double cover butt joint. The main plates are 12 mm thick connected by 18 mm diameter bolts at a pitch of 100 mm. Design the cover plate also. What is the percentage reduction in the efficiency of the joint if the plates are lap jointed ?

12. a) A double angle ISA 75 mm × 75 mm × 8 mm back to back welded to one side of a 12 mm gusset have allowable stress 150 MPa. Predict the allowable tensile load on the members, and weld length and overlap length of gusset plate.

(OR)

b) Design a tension member to carry a factored force of 340 KN. Use 20 mm diameter black bolts and a gusset plate of 8 mm thick.

13. a) Find the suitable design for a built-up column consisting of two channels connected by batten to carry an axial load of 800 KN; the effective length of the column is 6 m.

(OR)

b) Find the suitable design for a rolled steel beam section column to carry an axial load 1100 KN. The column is 4 m long and adequately in position but not in direction at both ends.

14. a) Find the suitable design for a simply supported steel joist with a 4.0 m effective span carries a udl of 40 kN/mover its span inclusive of self-weight. The beam is laterally unsupported. Take fy = 250 N/mm².

(OR)

b) Design a simply supported beam of effective span 1.5 m carrying a factored concentrated load of 360 KN at mid span.

15. a) Design a purlin for a roof truss having the following data : Span of the truss = 6.0 m, Spacing of truss = 3 m c/c, Inclination of roof = 30° spacing of Purlin = 2 m c/c, Wind pressure = 1.5 kN/m², Roof coverage = A.C Sheeting weighing 200 N/m², Provide a channel section Purlin.

(OR)

b) Calculate the dead load, live load and wind load on a 'Fink' type truss for the following data and mark the loads on the nodes of the truss. Span = 12 m, Pitch = ¼ of span, Height at eves level = 10 m from the ground Spacing of truss = 5 m c/c.

PART – C **(1×15=15 Marks)**

16. a) Design a suitable slab base for a column section ISHB 400@ 822 N/m. Supporting an axial load 500 KN. The base plate is to rest on a concrete pedestal of M20 grade concrete.

(OR)

b) A plate girder of span 15 m is made-up of web plates of 1600 mm × 8 mm flange angles 150 mm × 115 mm × 10 mm and two flange plates 480 mm × 10 mm it carries a uniformly distributed load of 100 kN/m including its own weight. Identify the suitable design and sketch the web splices at 5 m from one end.

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80218

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Sixth Semester

Civil Engineering

CE 6603 — DESIGN OF STEEL STRUCTURES

(Regulations 2013)

Time : Three hours Maximum : 100 marks

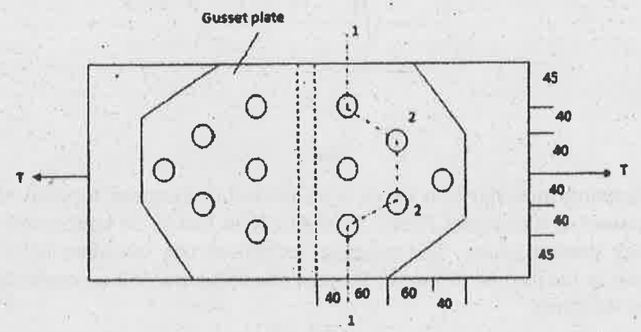
Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the stress-strain curve for mild steel bar showing the salient points.

2. List out the failure of bolted joint.

3. Calculate the net effective area for the bolted connection shown in fig. 1 for section 1-2-2-1. Use 4.6 grade bolt of diameter 24 mm.



All dimensions are in mm

Fig. 1

4. What is meant by shear lag?

5. Define slenderness ratio.

6. What are the different ways by which a compression member buckles?

7. What are the different types of stiffeners provided in a plate girder?

8. Why do compression flanges require lateral support?

9. Write the equation to calculate the design wind pressure.

10. What is a purlin?

PART B — (5 × 16 = 80 marks)

11. (a) A bracket connection is shown in Fig 2 with 24 mm diameter bolts of grade 4.6 and plate of grade Fe 410 steel, determine the safe load (P) that could be transferred through the connection.

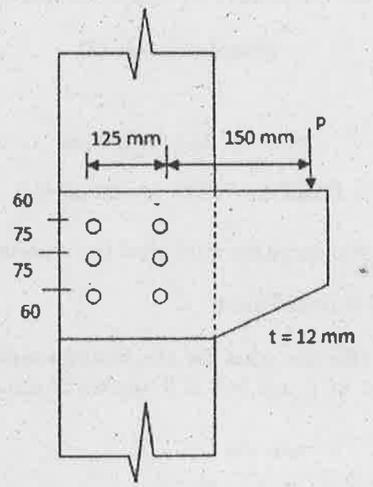


Fig.2

Or

(b) A tension member of a truss is subjected to factored tension of 850 kN. It consists of a channel ISMC 350@413 N/m has to be connected to a 10 mm thick gusset plate. The overlap length of the member with the gusset plate is limited to 300 mm. Design the fillet welded connection, assuming site welding.

12. (a) Design an angle section to carry a factored tensile force of 200 kN. Bolts of 20 mm diameter of grade 4.6 are to be provided for the connection of the members to the gusset plate. Use f_y = 250 MPa and f_u = 410 MPa.

Or

(b) A tension member consists of two angles 80 × 10 × 6 mm bolted to opposite sides of 12 mm thick gusset plate using single row of 5 nos. of 20 mm diameter bolts at a distance of 35 mm from toe of the angle. Take pitch as 50 mm and end distance = 40 mm. the length of the member is 4 m. use Fe 410 grade steel. Determine the maximum load that the member can carry. What will be the load carrying capacity if the angles are connected on the same side of the gusset?

13. (a) Calculate the compressive resistance of a compound column consisting ISMB 500 with one cover plate 350 × 20 mm on each flange and having a length of 5 m. Assume that the bottom of column is fixed and top is rotation fixed, translation free. Take f_y = 250 N/mm².

Or

(b) A steel column ISHB 400 @ 759.3 N/m is subjected to a factored axial load of 2000 kN. Design a slab base plate for the column. Assume that the bearing surfaces of the column and base plate are machined and the concrete footing is of M 20 grade.

14. (a) A simply supported beam of span 3.25 m consists of rolled steel section ISLB 325 @ 422.8 N/m. Determine the design bending strength of the beam, if the beam is laterally unsupported.

Or

(b) A welded plate girder of span 25 m is laterally restrained throughout its length. It has to carry a load of 80 kN/m over the whole span besides its weight. Design the girder without intermediate transverse stiffness.

15. (a) Design a channel section [shape purlin placed on a sloping roof truss with dead load of 0.15 kN/m² (cladding and insulation), a live load of 2 kN/m² and wind load of 0.5 kN/m² (suction). The purlins are spaced 2 m c/c and of span 4 m, simply supported on a rafter at a slope of 20°.

Or

(b) Explain step by step procedure in the design of gantry girders. Also explain the loads that would be considered in the design.

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24/11/18

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20279

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Sixth Semester

Civil Engineering

CE 6603 — DESIGN OF STEEL STRUCTURES

(Regulations 2013)

(PTCE 6603 — Design of Steel Structures — for B.E. (Part – Time) Fourth Semester Civil Engineering — Regulations — 2014)

Time : Three hours Maximum : 100 marks

(Use of IS 800 is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define nominal diameter of rivet.
2. Define Poisson's Ratio.
3. What are stiffened seat connections?
4. Mention any two disadvantages of welded connection.
5. What is meant by short strut?
6. What is the purpose for providing anchors bolt in base plate?
7. Define shape factor
8. What is meant by limit state design?
9. What is meant by first yield moment?
10. Define shear lag.

PART B — (5 × 13 = 65 marks)

11. (a) A column ISHB 350 @ 661.2 N/m carries an axial compressive factored load of 1700 kN. Design a suitable bolted gusset base. The base rests on M 15 grade concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connections. (13)

Or

(b) Design an I section purlin, for an industrial building situated in the outskirts of Allahabad, to support a galvanised corrugated iron sheet roof of the following data:

Spacing of the truss c/c = 6.0 m

Span of truss = 12.0 m

Slope of truss = 30°

Spacing of purlins c/c = 1.5 m

Intensity of wind pressure = 2 kN/m²

Weight of galvanised sheets = 130 N/m².

Grade of steel = Fe 410. (13)

12. (a) Design a suitable bolted bracket connection of a ISHT-75 section attached to the flange of a ISHB 300 at 577 N/m to carry a vertical factored load of 600 kN at an eccentricity of 300 mm. Use M 24 bolts of grade 4.6. (13)

Or

(b) A tie member consisting of an ISA 80 mm × 50 mm × 8 mm (Fe 410 grade steel) is welded to a 12 mm thick gusset plate at site. Design welds to transmit load equal to the design strength of the member. (13)

13. (a) Design the principal rafter of Pratt type roof truss for the following data. Design also it's connection using 20 mm diameter bolts.

Design compressive load = 170 kN (due to D.L and L.L)

Design tensile load = 60 kN (due to D.L and L.L)

Length of rafter panel = 2.5 m

Grade of steel Fe 410

Grade bolts 4.6. (13)

Or

(b) Design a single angle strut connected to the gusset plate to carry 180 kN factored load. The length of the strut between centre to centre intersections is 3 m. (13)

14. (a) A built-up I-section has the following dimensions : Flanges : 250 × 6 mm; Web : 300 × 3 mm. Calculate the plastic section modulus and plastic moment capacity of the section. Also find the shape factor. (13)

Or

(b) An ISMB 400 transfers an end reaction of 160 kN to the flange of an ISHB 300 @ 577N/m. design an unstiffened welded seat connection. take fb =185 N/mm². (13)

15. (a) Design a column using a rolled steel I-section with cover plates to carry a factored axial load of 2000 kN. The effective length in both the planes is 5m. Take fy = 250 MPa and E= 200 GPa. (13)

Or

(b) List out the various elements of the roof truss and mark all its significance. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Design a steel stanchion of effective length 5 m to carry a factored load of 500 kN. (15)

Or

(b) Explain the design principles of gantry girder. (15)

26/11/19 AN

Reg. No. :

Question Paper Code : 91313

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Sixth Semester

Civil Engineering

CE 6603 – DESIGN OF STEEL STRUCTURES

(Common to PTCE 6603 – Design of Steel Structures for B.E. (Part-Time) – Fourth Semester – Civil Engineering (Regulations – 2014))

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Use of IS 800-2007, IS 875- Part 3 and steel tables is permitted.
Relevant data may be suitably assumed if found necessary.
Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. How is the ductility of steel measured ?
2. Can bolted connections be hundred percent efficient ? Why ?
3. What are the various types of tension members ?
4. What is net sectional area ?
5. What is meant by short strut ?
6. What is the purpose for providing anchors bolt in base plate ?
7. What do you mean by castellated beam ?
8. What do you mean by curtailment of flanges ?
9. Write the equation to calculate the design wind pressure.
10. What is a purlin ?

PART – B (5×13=65 Marks)

11. a) A column ISHB 350 @ 661.2 N/m carries an axial compressive factored load of 1700 kN. Design a suitable bolted gusset base. The base rests on M 15 grade concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connections. **(13)**

(OR)

b) Design an I section purlin, for an industrial building situated in the outskirts of Allahabad, to support a galvanised corrugated iron sheet roof of the following data :

Spacing of the truss c/c = 6.0 m

Span of truss = 12.0 m

Slope of truss = 30°

Spacing of purlins c/c = 1.5 m

Intensity of wind pressure = 2 kN/m^2

Weight of galvanised sheets = 130 N/m^2.

Grade of steel = Fe 410 **(13)**

12. a) Design an angle section to carry a factored tensile force of 200 kN. Bolts of 20 mm diameter of grade 4.6 are to be provided for the connection of the members to the gusset plate. Use f_y = 250 MPa and f_u = 410 MPa. **(13)**

(OR)

b) A tension member consists of two angles 80 × 10 × 6 mm bolted to opposite sides of 12mm thick gusset plate using single row of 5 nos. of 20 mm diameter bolts at a distance of 35 mm from toe of the angle. Take pitch as 50 mm and end distance = 40 mm. The length of the member is 4 m. Use Fe 410 grade steel. Determine the maximum load that the member can carry. What will be the load carrying capacity if the angles are connected on the same side of the gusset ? **(13)**

13. a) Design a built up column 6 m long to carry a load of 400 kN. The column is restrained in position but not in direction at both the ends. Provide single angle lacing system with bolted connections. **(13)**

(OR)

b) A built up column consists of ISHB 400 @ 77.40 kg/m with one 300 mm × 12 mm flange plate on each side. The column carries an axial load of 2600 kN. Design a gusseted base if the column is supported on concrete pedestal with a bearing pressure of 5 N/mm^2. **(13)**

14. a) Design a laterally restrained beam of effective span 7 m to carry a factored bending moment of 100 kNm and a factored shear force of 225 kN. **(13)**

(OR)

b) Find the plastic moment capacity about the Z-Z axis of the section shown in Figure Q.14 (b). **(13)**

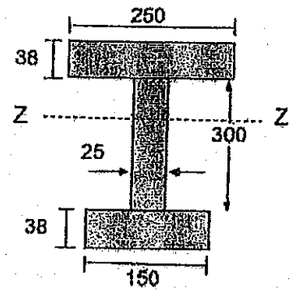

Figure Q. 14 (b)

15. a) Calculate the dead load, live load and wind load at the nodes of a pinned end fink truss with the following data :

Span of truss = 16 m

Rise of truss = 4m

Spacing of truss = 4m

Self weight of purlins = 300 N/m

Height of column = 10m

Roofing shall be of GI sheets

Building is located in Chennai. Use Fe 410 steel. **(13)**

(OR)

b) Explain step by step procedure in the design of gantry girders. Also explain the loads that would be considered in the design. **(13)**

PART – C (1×15=15 Marks)

16. a) Design a bridge truss diagonal subjected to a factored load of 300 kN. The length of the diagonal in 3m. The Tension member is connected to a gusset plate 16 mm thick with one line of 20 mm dia bolts of grade 8.8.

(OR)

b) Elaborate the step by step procedures for the design of analysis of roof trusses.

25/11/17 AN

Reg. No. :

Question Paper Code : 50296

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Sixth Semester
Civil Engineering
CE 6603 – DESIGN OF STEEL STRUCTURES
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

IS : 800 – 2007, Steel Tables are Permitted.
Answer ALL questions.

PART – A (10×2=20 Marks)

1. List the types of failures in a riveted joints.
2. Define efficiency of joints.
3. What is a tension splice ?
4. What is a lug angles ?
5. What is meant by slenderness ratio ?
6. State the possible failure modes in an axially loaded column.
7. Why do compression flanges require lateral support ?
8. Write short note on web splices.
9. List the types of roof trusses.
10. Write the types of load combinations for the analysis of a root truss.

PART – B (5×16=80 Marks)

11. a) Design a single bolted double cover butt joint to connect plates of f_y 410 grade having thickness 16mm. Use M16 bolts of grade 4.6. Find the efficiency of the joint.

(OR)

b) A double riveted lap joint in plates 10mm thick is made with 16 mm rivets at 60 mm pitch. Estimate how the joint will fail and calculate its efficiency if the tearing strength of the plates is 475 N/mm^2 and shearing and bearing strength of the rivets are 380 N/mm^2 and 750 N/mm^2 respectively.

12. a) Design a double angle tension member connected on each side of a 12 mm thick gusset plate to carry an axial factored load of 400 kN. Use 20 mm black bolts. Assume shop connection.

(OR)

b) Design a splice to connect a 300 × 20 mm plate with a 300 × 10 mm plate. The design load is 500kN. Use 20 mm bolts fabricated in shop.

13. a) Design a built-up column for a length of 3.5m to support a working load of 3500 kN. The column is effectively held at both ends and restrained in direction at one of the ends.

(OR)

b) Design a gusseted base connection for a column ISHB 400 @ 822 N/m supporting an axial load of 500 kN. The base plate is to rest on a concrete pedestal of M20 grade concrete.

14. a) Design a simply supported beam of span 5m to carry a factored Uniformly distributed load of 47 kN/m.

(OR)

b) Design a load carrying stiffener to carry a load of 600 kN for the section ISMB 450.

15. a) Design the purlin for the following specifications. Span of truss = 12m, Pitch = one fifth of span, Spacing of truss = 5 m, spacing of purlins = 1.5m, load from roofing materials = 200 N/m^2, Wind load = 1200 N/m^2. Use angle section.

(OR)

b) Explain the steps involved in the design of gantry girder.
