SLR-TX – 46

Seat No.	

Set P

T.E. (Civil) (Part – I) (New CBCS) Examination, 2018
DESIGN OF STEEL STRUCTURES

Day and Date : Friday, 30-11-2018 Total Marks : 70
Time : 2.30 p.m. to 5.30 p.m.

N. B. *:* 1) ***Use*** *of IS 800-2007 and IS 875 are allowed, but* ***not*** *allowed for MCQ (Q. No. 1)*
2) *Use of scientific non programmable calculator is allowed.*
3) *Figures to the* ***right*** *indicate the* ***full*** *marks.*
4) *Assume suitable data* ***if necessary*** *and mention* ***it clearly*** *before the solution.*
5) *Draw the appropriate sketches* ***whenever*** *necessary.*
6) *Q. No.* ***1*** *is* ***compulsory****. It should be solved in* ***first 30 minutes*** *in Answer Book Page No.* ***3****.* ***Each*** *question carries* ***one*** *mark.*
7) ***Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.***

MCQ/Objective Type Questions

Duration : 30 Minutes Marks : 14

1. Choose the correct option : **14**

i) The maximum strain at the end of plastic hinge for structural steel is about _____
a) 0.11% b) 1.5% c) 15% d) 25%

ii) The design wind speed is V. The design wind pressure will be given as _____
a) 0.4 V^2 b) 0.5 V^2 c) 0.6 V^2 d) 0.8 V^2

iii) The collapse load for a propped cantilever of span 1 subjected to central point load is
a) 0.414 Mp/l b) 0.586 Mp/l c) 11.656 Mp/l d) None of the above

iv) Which of the following sections has maximum value of shape factor ?
a) Triangular section b) I – section
c) Rectangular section d) Circular section

P.T.O.

v) The bending moment at plastic hinge is
   a) equal to zero
   b) equal to yield moment of the section
   c) equal to plastic moment of the section
   d) greater than the plastic moment of the section

vi) If the same number of bolts has been used in the joints, then which of the following patterns will yield highest efficiency ?
   a) Chain b) Staggered
   c) Diamond d) Staggered diamond

vii) The value of load factor which occurs for margin of safety in plastic design for gravity load is about
   a) 1.15 b) 1.65 c) 1.85 d) 2.25

viii) The most economical section for column is
   a) rectangular b) solid round c) tubular d) hexagonal

ix) Web crippling generally occurs at the point where
   a) Bending moment is maximum b) Shear force is maximum
   c) Concentrated load acts d) Deflection is maximum

x) The maximum permissible slenderness ratio of a member carrying loads resulting from wind is
   a) 180 b) 200 c) 250 d) 350

xi) The rolled steel I section are most commonly used as beam because these provides
   a) Large moment of inertia of less cross sectional area
   b) Large moment of resistance as compared to other section
   c) greater lateral stability
   d) all the above

xii) The thickness of single flat lacing should not be less than
   a) 1/30th length between inner rivets b) 1/40th length between inner rivets
   c) 1/50th length between inner rivets d) 1/60th length between inner rivets

xiii) Shape factor is the property which depends
   a) Only on ultimate stress of material
   b) Only on yield stress of material
   c) Only on geometry of section
   d) Both on yield stress and ultimate stress of material

xiv) The number of seismic zones in which the country has been divided as
   a) 3 b) 5 c) 6 d) 7

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SLR-TX – 46

Seat No.	

T.E. (Civil) (Part – I) (New CBCS) Examination, 2018
DESIGN OF STEEL STRUCTURES

Day and Date : Friday, 30-11-2018 Marks : 56

Time : 2.30 p.m. to 5.30 p.m.

N. B. *:* 1) *Attempt* ***any three*** *questions from* ***each*** *Section.*
2) ***Use*** *of IS 800-2007 and IS 875 are allowed, but* ***not*** *allowed for MCQ (Q. No. 1)*
3) *Use of scientific non programmable calculator is allowed.*
4) *Figures to the* ***right*** *indicate the* ***full*** *marks.*
5) *Assume suitable data* ***if necessary*** *and mention* ***it clearly*** *before the solution.*
6) *Draw the appropriate sketches* ***whenever*** *necessary.*

SECTION – I

2. Determine the tensile strength of ISMC 175 when it is connected to gusset plate through the web by two rows of 16 mm bolts with a connecting length of 100 mm. **9**

3. Design single angle discontinuous strut to carry a factored axial compressive load of 62 kN the length of the strut is 2.9 m between intersections. It is connected to 12 mm thick gusset plate by 20 mm diameter 4.6 grade bolts. Use Fe410 grade of steel. **9**

4. Design a built up column of two rolled I sections to resist an axial load of 3500 kN. The length of the column is 4.6 m. It is restrained against rotation and translation at bottom and restrained against rotation and free at top. Take Fy = 250 Mpa. Design the suitable lacing or battening system. **10**

5. Attempt the following : **9**
   a) Explain web buckling and web crippling with neat sketch.
   b) Classification of cross sections such as plastic. compact, semi-compact, slender with necessary sketches.
   c) Theorems of plastic analysis.

Set P

SECTION – II

6. A simply supported beam of span L of circular section is subjected to central point load W find
   a) Shape factor of circular section
   b) Length of plastic hinge. **10**

7. A proposed cantilever beam in built in a concrete wall. It supports a dead load of 20 kN/m and a live load of 10 kN/m. The length of beam is 5 m. Select a suitable section with necessary checks. Assume stiff bearing length of 100 mm. **9**

8. A 10 m × 10 m godown is to be constructed. The steel roof trusses will be used for roofing. The trusses will be supported over masonry walls 300 mm thick. Galvanized corrugated iron sheets will be used for covering. Propose a suitable type of roof truss.

   The basic wind pressure is 1.0 KN/m^2 and there is no any snowfall. Determine load at each panel point. **9**

9. A column ISHB 300 @ 0.630 kN/m with one cover plate 400 mm × 20 mm on either side is carrying axial load of 1700 kN. Design gusseted base.
   M20 grade of concrete is to be used under the base slab. **9**

SLR-TX – 46

Seat No.	

Set Q

T.E. (Civil) (Part – I) (New CBCS) Examination, 2018
DESIGN OF STEEL STRUCTURES

Day and Date : Friday, 30-11-2018 Total Marks : 70
Time : 2.30 p.m. to 5.30 p.m.

N. B. *:* 1) ***Use*** *of IS 800-2007 and IS 875 are allowed, but* ***not*** *allowed for MCQ (Q. No. 1)*
2) *Use of scientific non programmable calculator is allowed.*
3) *Figures to the* ***right*** *indicate the* ***full*** *marks.*
4) *Assume suitable data* ***if necessary*** *and mention* ***it clearly*** *before the solution.*
5) *Draw the appropriate sketches* ***whenever*** *necessary.*
6) *Q. No.* ***1*** *is* ***compulsory****. It should be solved in* ***first 30 minutes*** *in Answer Book Page No.* ***3****.* ***Each*** *question carries* ***one*** *mark.*
7) ***Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.***

MCQ/Objective Type Questions

Duration : 30 Minutes Marks : 14

1. Choose the correct option : **14**

i) The most economical section for column is
a) rectangular b) solid round c) tubular d) hexagonal

ii) Web crippling generally occurs at the point where
a) Bending moment is maximum b) Shear force is maximum
c) Concentrated load acts d) Deflection is maximum

iii) The maximum permissible slenderness ratio of a member carrying loads resulting from wind is
a) 180 b) 200 c) 250 d) 350

iv) The rolled steel I section are most commonly used as beam because these provides
a) Large moment of inertia of less cross sectional area
b) Large moment of resistance as compared to other section
c) greater lateral stability
d) all the above

P.T.O.

v) The thickness of single flat lacing should not be less than
a) 1/30th length between inner rivets b) 1/40th length between inner rivets
c) 1/50th length between inner rivets d) 1/60th length between inner rivets

vi) Shape factor is the property which depends
a) Only on ultimate stress of material
b) Only on yield stress of material
c) Only on geometry of section
d) Both on yield stress and ultimate stress of material

vii) The number of seismic zones in which the country has been divided as
a) 3 b) 5 c) 6 d) 7

viii) The maximum strain at the end of plastic hinge for structural steel is about _____
a) 0.11% b) 1.5% c) 15% d) 25%

ix) The design wind speed is V. The design wind pressure will be given as _____
a) 0.4 V^2 b) 0.5 V^2 c) 0.6 V^2 d) 0.8 V^2

x) The collapse load for a propped cantilever of span 1 subjected to central point load is
a) 0.414 Mp/l b) 0.586 Mp/l c) 11.656 Mp/l d) None of the above

xi) Which of the following sections has maximum value of shape factor ?
a) Triangular section b) I – section
c) Rectangular section d) Circular section

xii) The bending moment at plastic hinge is
a) equal to zero
b) equal to yield moment of the section
c) equal to plastic moment of the section
d) greater than the plastic moment of the section

xiii) If the same number of bolts has been used in the joints, then which of the following patterns will yield highest efficiency ?
a) Chain b) Staggered
c) Diamond d) Staggered diamond

xiv) The value of load factor which occurs for margin of safety in plastic design for gravity load is about
a) 1.15 b) 1.65 c) 1.85 d) 2.25

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SLR-TX – 46

Seat No.	

T.E. (Civil) (Part – I) (New CBCS) Examination, 2018
DESIGN OF STEEL STRUCTURES

Day and Date : Friday, 30-11-2018 Marks : 56

Time : 2.30 p.m. to 5.30 p.m.

N. B. *:* 1) *Attempt* ***any three*** *questions from* ***each*** *Section.*
2) ***Use*** *of IS 800-2007 and IS 875 are allowed, but* ***not*** *allowed for MCQ (Q. No. 1)*
3) *Use of scientific non programmable calculator is allowed.*
4) *Figures to the* ***right*** *indicate the* ***full*** *marks.*
5) *Assume suitable data* ***if necessary*** *and mention* ***it clearly*** *before the solution.*
6) *Draw the appropriate sketches* ***whenever*** *necessary.*

SECTION – I

2. Determine the tensile strength of ISMC 175 when it is connected to gusset plate through the web by two rows of 16 mm bolts with a connecting length of 100 mm. **9**

3. Design single angle discontinuous strut to carry a factored axial compressive load of 62 kN the length of the strut is 2.9 m between intersections. It is connected to 12 mm thick gusset plate by 20 mm diameter 4.6 grade bolts. Use Fe410 grade of steel. **9**

4. Design a built up column of two rolled I sections to resist an axial load of 3500 kN. The length of the column is 4.6 m. It is restrained against rotation and translation at bottom and restrained against rotation and free at top. Take Fy = 250 Mpa. Design the suitable lacing or battening system. **10**

5. Attempt the following : **9**
   a) Explain web buckling and web crippling with neat sketch.
   b) Classification of cross sections such as plastic. compact, semi-compact, slender with necessary sketches.
   c) Theorems of plastic analysis.

Set Q

SECTION – II

6. A simply supported beam of span L of circular section is subjected to central point load W find
   a) Shape factor of circular section
   b) Length of plastic hinge. **10**

7. A proposed cantilever beam in built in a concrete wall. It supports a dead load of 20 kN/m and a live load of 10 kN/m. The length of beam is 5 m. Select a suitable section with necessary checks. Assume stiff bearing length of 100 mm. **9**

8. A 10 m × 10 m godown is to be constructed. The steel roof trusses will be used for roofing. The trusses will be supported over masonry walls 300 mm thick. Galvanized corrugated iron sheets will be used for covering. Propose a suitable type of roof truss.

   The basic wind pressure is 1.0 KN/m^2 and there is no any snowfall. Determine load at each panel point. **9**

9. A column ISHB 300 @ 0.630 kN/m with one cover plate 400 mm × 20 mm on either side is carrying axial load of 1700 kN. Design gusseted base.
   M20 grade of concrete is to be used under the base slab. **9**

SLR-TX – 46

Seat No.	

Set R

T.E. (Civil) (Part – I) (New CBCS) Examination, 2018
DESIGN OF STEEL STRUCTURES

Day and Date : Friday, 30-11-2018 Total Marks : 70
Time : 2.30 p.m. to 5.30 p.m.

N. B. *:* 1) ***Use*** *of IS 800-2007 and IS 875 are allowed, but* ***not*** *allowed for MCQ (Q. No. 1)*
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3) *Figures to the* ***right*** *indicate the* ***full*** *marks.*
4) *Assume suitable data* ***if necessary*** *and mention* ***it clearly*** *before the solution.*
5) *Draw the appropriate sketches* ***whenever*** *necessary.*
6) *Q. No.* ***1*** *is* ***compulsory****. It should be solved in* ***first 30 minutes*** *in Answer Book Page No.* ***3****.* ***Each*** *question carries* ***one*** *mark.*
7) ***Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.***

MCQ/Objective Type Questions

Duration : 30 Minutes Marks : 14

1. Choose the correct option : **14**

i) The bending moment at plastic hinge is
   a) equal to zero
   b) equal to yield moment of the section
   c) equal to plastic moment of the section
   d) greater than the plastic moment of the section

ii) If the same number of bolts has been used in the joints, then which of the following patterns will yield highest efficiency ?
   a) Chain b) Staggered
   c) Diamond d) Staggered diamond

iii) The value of load factor which occurs for margin of safety in plastic design for gravity load is about
   a) 1.15 b) 1.65 c) 1.85 d) 2.25

iv) The most economical section for column is
   a) rectangular b) solid round c) tubular d) hexagonal

P.T.O.

v) Web crippling generally occurs at the point where
   a) Bending moment is maximum b) Shear force is maximum
   c) Concentrated load acts d) Deflection is maximum

vi) The maximum permissible slenderness ratio of a member carrying loads resulting from wind is
   a) 180 b) 200 c) 250 d) 350

vii) The rolled steel I section are most commonly used as beam because these provides
   a) Large moment of inertia of less cross sectional area
   b) Large moment of resistance as compared to other section
   c) greater lateral stability
   d) all the above

viii) The thickness of single flat lacing should not be less than
   a) $1/30^{th}$ length between inner rivets b) $1/40^{th}$ length between inner rivets
   c) $1/50^{th}$ length between inner rivets d) $1/60^{th}$ length between inner rivets

ix) Shape factor is the property which depends
   a) Only on ultimate stress of material
   b) Only on yield stress of material
   c) Only on geometry of section
   d) Both on yield stress and ultimate stress of material

x) The number of seismic zones in which the country has been divided as
   a) 3 b) 5 c) 6 d) 7

xi) The maximum strain at the end of plastic hinge for structural steel is about _____
   a) 0.11% b) 1.5% c) 15% d) 25%

xii) The design wind speed is V. The design wind pressure will be given as _____
   a) $0.4\ V^2$ b) $0.5\ V^2$ c) $0.6\ V^2$ d) $0.8\ V^2$

xiii) The collapse load for a propped cantilever of span 1 subjected to central point load is
   a) 0.414 Mp/l b) 0.586 Mp/l c) 11.656 Mp/l d) None of the above

xiv) Which of the following sections has maximum value of shape factor ?
   a) Triangular section b) I – section
   c) Rectangular section d) Circular section

_____

SLR-TX – 46

Seat No.	

T.E. (Civil) (Part – I) (New CBCS) Examination, 2018
DESIGN OF STEEL STRUCTURES

Day and Date : Friday, 30-11-2018 Marks : 56

Time : 2.30 p.m. to 5.30 p.m.

N. B. *:* 1) *Attempt **any three** questions from **each** Section.*
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5) *Assume suitable data **if necessary** and mention **it clearly** before the solution.*
6) *Draw the appropriate sketches **whenever** necessary.*

SECTION – I

2. Determine the tensile strength of ISMC 175 when it is connected to gusset plate through the web by two rows of 16 mm bolts with a connecting length of 100 mm. **9**

3. Design single angle discontinuous strut to carry a factored axial compressive load of 62 kN the length of the strut is 2.9 m between intersections. It is connected to 12 mm thick gusset plate by 20 mm diameter 4.6 grade bolts. Use Fe410 grade of steel. **9**

4. Design a built up column of two rolled I sections to resist an axial load of 3500 kN. The length of the column is 4.6 m. It is restrained against rotation and translation at bottom and restrained against rotation and free at top. Take Fy = 250 Mpa. Design the suitable lacing or battening system. **10**

5. Attempt the following : **9**
   a) Explain web buckling and web crippling with neat sketch.
   b) Classification of cross sections such as plastic. compact, semi-compact, slender with necessary sketches.
   c) Theorems of plastic analysis.

Set R

SECTION – II

6. A simply supported beam of span L of circular section is subjected to central point load W find
   a) Shape factor of circular section
   b) Length of plastic hinge. **10**

7. A proposed cantilever beam in built in a concrete wall. It supports a dead load of 20 kN/m and a live load of 10 kN/m. The length of beam is 5 m. Select a suitable section with necessary checks. Assume stiff bearing length of 100 mm. **9**

8. A 10 m × 10 m godown is to be constructed. The steel roof trusses will be used for roofing. The trusses will be supported over masonry walls 300 mm thick. Galvanized corrugated iron sheets will be used for covering. Propose a suitable type of roof truss.

   The basic wind pressure is 1.0 KN/m^2 and there is no any snowfall. Determine load at each panel point. **9**

9. A column ISHB 300 @ 0.630 kN/m with one cover plate 400 mm × 20 mm on either side is carrying axial load of 1700 kN. Design gusseted base.
   M20 grade of concrete is to be used under the base slab. **9**

SLR-TX – 46

Seat No.	

Set **S**

T.E. (Civil) (Part – I) (New CBCS) Examination, 2018
DESIGN OF STEEL STRUCTURES

Day and Date : Friday, 30-11-2018 Total Marks : 70
Time : 2.30 p.m. to 5.30 p.m.

N. B. *:* 1) ***Use*** *of IS 800-2007 and IS 875 are allowed, but* ***not*** *allowed for MCQ (Q. No. 1)*
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MCQ/Objective Type Questions

Duration : 30 Minutes Marks : 14

1. Choose the correct option : **14**

i) The maximum permissible slenderness ratio of a member carrying loads resulting from wind is
a) 180 b) 200 c) 250 d) 350

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a) $1/30^{th}$ length between inner rivets b) $1/40^{th}$ length between inner rivets
c) $1/50^{th}$ length between inner rivets d) $1/60^{th}$ length between inner rivets

P.T.O.

iv) Shape factor is the property which depends
a) Only on ultimate stress of material
b) Only on yield stress of material
c) Only on geometry of section
d) Both on yield stress and ultimate stress of material

v) The number of seismic zones in which the country has been divided as
a) 3 b) 5 c) 6 d) 7

vi) The maximum strain at the end of plastic hinge for structural steel is about _____
a) 0.11% b) 1.5% c) 15% d) 25%

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a) 0.414 Mp/l b) 0.586 Mp/l c) 11.656 Mp/l d) None of the above

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xi) If the same number of bolts has been used in the joints, then which of the following patterns will yield highest efficiency ?
a) Chain b) Staggered
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xiv) Web crippling generally occurs at the point where
a) Bending moment is maximum b) Shear force is maximum
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_____

SLR-TX – 46

Seat No.	

T.E. (Civil) (Part – I) (New CBCS) Examination, 2018
DESIGN OF STEEL STRUCTURES

Day and Date : Friday, 30-11-2018 Marks : 56

Time : 2.30 p.m. to 5.30 p.m.

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SECTION – I

2. Determine the tensile strength of ISMC 175 when it is connected to gusset plate through the web by two rows of 16 mm bolts with a connecting length of 100 mm. **9**

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5. Attempt the following : **9**
   a) Explain web buckling and web crippling with neat sketch.
   b) Classification of cross sections such as plastic. compact, semi-compact, slender with necessary sketches.
   c) Theorems of plastic analysis.

Set S

SECTION – II

6. A simply supported beam of span L of circular section is subjected to central point load W find
   a) Shape factor of circular section
   b) Length of plastic hinge. **10**

7. A proposed cantilever beam in built in a concrete wall. It supports a dead load of 20 kN/m and a live load of 10 kN/m. The length of beam is 5 m. Select a suitable section with necessary checks. Assume stiff bearing length of 100 mm. **9**

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   M20 grade of concrete is to be used under the base slab. **9**