Enrollment No......................................

Faculty of Engineering
End Sem (Even) Examination May-2022
CE3CO14 Design of Steel Structures

Programme: B.Tech.   Branch/Specialisation: CE

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Which of the following relation is correct?   **1**
(a) Permissible Stress = Yield Stress x Factor of Safety
(b) Permissible Stress = Yield Stress / Factor of Safety
(c) Yield Stress = Permissible Stress / Factor of Safety
(d) Permissible Stress = Yield Stress – Factor of Safety

ii. Size of rivet hole is _____ size of rivet.   **1**
(a) More than   (b) Less than
(c) Equal to   (d) Not compared with

iii. Which of the following is advantage of HSFG bolts overbearing type **1**
bolts?
(a) Joints are not rigid
(b) Bolts are subjected to shearing and bearing stresses
(c) High strength fatigue
(d) Low static strength

iv. Clip and seating angle connection is provided for-   **1**
(a) Lateral support   (b) Bending support
(c) Frictional support   (d) Hinged support

v. A plate girder is used when-   **1**
(a) Span is large and loads are heavy
(b) Span is small and loads are heavy
(c) Span is small and loads are light
(d) Span is large and loads are light

vi. Effective length of compression member is _____.   **1**
(a) Distance between ends of members
(b) Distance between end point and midpoint of member
(c) Distance between points of contraflexure
(d) Distance between end point and centroid of member

P.T.O.

vii. Moment Resistant Connections transfer:　**1**
(i) Moments, (ii) Axial force, (iii) Shear force
(a) (i) only　　　　　　　　(b) Both (i) and (ii)
(c) Both (ii) and (iii)　　　　(d) All of these

viii. What is slenderness ratio of a tension member?　**1**
(a) Ratio of its least radius of gyration to its unsupported length
(b) Ratio of its unsupported length to its least radius of gyration
(c) Ratio of its maximum radius of gyration to its unsupported length
(d) Ratio of its unsupported length to its maximum radius of gyration

ix. Generally, purlins are placed at the panel points so as to avoid-　**1**
(a) Axial force in rafter　　　　(b) Shear force in rafter
(c) Deflection of rafter　　　　(d) Bending moment in rafter

x. To minimize the total cost of a roof truss the ratio of cost of truss to　**1**
cost of purlins shall be-
(a) 1　　　　(b) 2　　　　(c) 3　　　　(d) 4

Q.2 i. Write a note on structural properties of steel.　**2**
ii. Discuss partial load factors.　**3**
iii. Define bolted connection explain the various failures of bolted joints　**5**
with the help of neat diagrams.
OR iv. A bracket is bolted the flange of a column as shown in figure using　**5**
8mm thick bracket plate using M20 bolts of grade 4.6 design the
connections.

350mm
300KN
8mm bracket plate
ISHB 300@577 N/m
250 mm
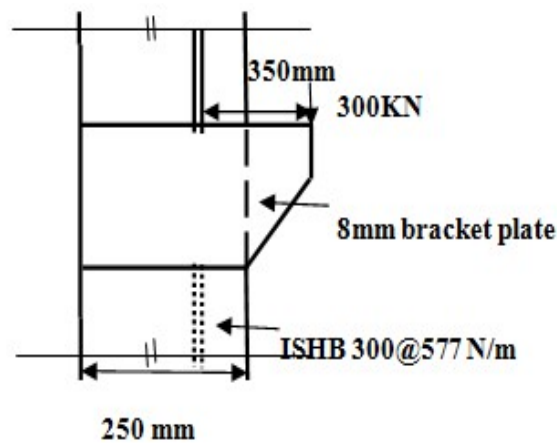
Q.3 i. What is the difference between bending and buckling of a beam　**2**
member? State the checks to be performed for beam design.

ii. A beam MB 600 @123 kgf/m has an effective span of 9 m. Two floors　**8**
joints transmit the floor load at a distance of 3m from each end.
Determine the safe load which the two floor joints can transmit on the
beam if the beam is effectively restrained laterally by the floor joints
the steel conforms to IS code.

OR iii. Design a load caring stiffener for a load of 350 kN for the section　**8**
ISLB400.

Q.4 i. What is the basic difference in behaviour between tension and　**3**
compression members while resisting the loads?

ii. Calculate the strength of ISA 40x25, 6mm thick when used as a　**7**
tension member with its longer leg connected by:
(a) 14mm dia. Rivets　　　　(b) Fillet weld.

OR iii. A single angle strut ISA 50x50x6 mm of a roof truss is 1.06 m long. It　**7**
is connected by one rivet at each end. Determine the safe load this strut
can carry.

Q.5 i. State the different state to be followed while designing a slab base.　**4**
ii. Design a column section to carry a load of 350 kN at an eccentricity　**6**
of 100mm from the x-x axis the effective length of column is 3.8m.
Use IS code.

OR iii. Design the slab base for a column consisting of ISHB 300 @58.8　**6**
kg/m and carrying an axial load of 1000 kN. Take allowable bearing
pressure on concrete as 4 N/mm^2.

Q.6 Attempt any two:
i. What is the procedure analysing the roof truss?　**5**
ii. Define roof trusses and their types with neat diagram.　**5**
iii. Explain purlin and their elements of truss in details.　**5**

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Marking Scheme
CE3CO14 Design of Steel Structures

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ii. Size of rivet hole is _____ size of rivet. **1**
(a) More than

iii. Which of the following is advantage of HSFG bolts overbearing type bolts? **1**
(a) Joints are not rigid

iv. Clip and seating angle connection is provided for- **1**
(a) Lateral support

v. A plate girder is used when- **1**
(a) Span is large and loads are heavy

vi. Effective length of compression member is _____. **1**
(a) Distance between ends of member

vii. Moment Resistant Connections transfer: **1**
(i) Moments, (ii) Axial force, (iii) Shear force
(d) All of these

viii. What is slenderness ratio of a tension member? **1**
(b) Ratio of its unsupported length to its least radius of gyration

ix. Generally, purlins are placed at the panel points so as to avoid- **1**
(d) Bending moment in rafter

x. To minimize the total cost of a roof truss the ratio of cost of truss to cost of purlins shall be- **1**
(b) 2

Q.2 i. Any two properties 1 mark each (1 Mark*2) **2**
ii. Definition — 3 Marks **3**
iii. Definition — 2 Marks **5**
Types — 2 Marks
Diagrams. — 1 Mark

OR iv. Formula — 2 Marks **5**
Number of bolts — 2 Marks
Pattern — 1 Mark

Q.3 i. Difference — 1 Mark **2**
Check — 1 Mark

ii. Load diagram — 1 Mark **8**
BMSF — 2 Mark

Section classification — 1 Mark
MD — 2 Marks
Calculation of load — 1 Mark
SF — 1 Mark

OR iii. Write sectional properties — 3 Marks **8**
Formula with calculation — 4 Marks
Check — 1 Mark

Q.4 i. Difference — 3 Marks **3**
ii. (a) 14mm dia. Rivets **7**
Formula T_{dg}, T_{dn}, T_{db} — 2 Marks
Rivets calculation — 1.5 Marks
(c) Fillet weld.
Formula T_{dg}, T_{dn}, T_{db} — 2 Marks
(d) Rivets calculation — 1.5 Marks

OR iii. Properties — 2 Marks **7**
F_{cd} — 3 Marks
P_d — 2 Marks

Q.5 i. For each step — 1 Mark **4**
(1 Mark*4)

ii. Load and BM calculation — 3 Marks **6**
Design — 2 Marks
Check — 1 Mark

OR iii. Area of slab base — 3 Marks **6**
Diagram — 1 Mark
Thickness of plate — 2 Marks

Q.6 Attempt any two:
i. Design step — 1 Mark each **5**
(1 Mark*5)

ii. Definition — 2 Marks **5**
Types — 1 Mark each
(1 Mark*3)

iii. Definition — 2 Marks **5**
Elements of truss — 1 Mark each
(1 Mark*3)

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