

- Q.30 Calculate the safe load-curving capacity of ISHB300@433.6 N/m when used as a column with an unsupported length of 4m. Both the ends of the column are fixed. Take $f_y=250 \text{ N/mm}^2$
- Q.31 Define a plate girder. Draw a neat sketch of it showing:
- Flange angles
 - Flange cover plates
 - Bearing Stiffener
 - Horizontal stiffener
- Q.32 A rolled steel joist ISMB 450@ 855.4 N/m is used as a simply supported beam over an effective span of 6m. Computer the value of the safe uniformly distributed load (udl) exclusive of the beam's self-weight when applied over the beam's full length. The permissible bending stress is 165 N/m².
- Q.33 Write the definition of a roof truss. Enlist different types of roof trusses along with the sketches.
- Q.34 Discuss various important considerations in the fabrication and erection of steel structures.
- Q.35 What is foundation? Write the factors which influence the depth of foundation and equation to calculate minimum foundation depth.

Section-D

- Note:** Long answer questions. Attempt any two question out of three Questions. (2x10=20)
- Q.36 Design a tie member, 2.8m long, of a roof truss consisting of an unequal angle section. It is subjected to a load of 200kN and is connected by 20mm rivets at the ends. The $T_{vf}=90 \text{ N/mm}^2$, $Spf=270 \text{ N/mm}^2$, and $Sat=150 \text{ N/mm}^2$.
- Q.37 A rolled steel beam of span 4.5 and carrying a uniformly distributed load of intensity 40 kN/m over its whole span. Design the laterally restrained beam taking yield steel of steel as 250 MPa. Check the beam in shear and deflection.
- Q.38 Design the foundation for one and half brick thick brick wall and carrying 40kN/m axial load including the self weight of the wall. Soil's safe bearing capacity is 120kN/m². Take soil density as 19kN/m³. Concrete in foundation bed is 1:3:6 bricks of size 200mm x 100mm x 100 mm are available.

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**5th Sem. / Civil., Constr., Mgmt., Civil Engg.
(Spl. Highway Engg.)
Subject : Steel Structures Design**

Time : 3 Hrs.

M.M. : 100

SECTION-A

Note: Multiple type Questions. All Questions are compulsory. (10x1=10)

- Q.1 For the same dept of member, the lighter section is
- ISLB
 - ISMB
 - ISJB
 - ISWB
- Q.2 IS: 875 (Part-3) 1987 deals with :
- Snow Loads
 - Wind Loads
 - Impact Loads
 - Imposed Loads
- Q.3 In a single cover butt joint, cove plate of 10mm thickness is used to connect 15mm thick plates. Thickness of joint will be :
- 15 mm
 - 25 mm
 - 5 mm
 - 10 mm
- Q.4 For a bolt of nominal diameter 12 mm, the size of bolt hole will be :
- 13 mm
 - 15 mm
 - 14 mm
 - 12 mm
- Q.5 For a rolled angle section ISA 150x115x15, the maximum size of fillet weld will be:
- 10 mm
 - 13.50 mm
 - 11.25 mm
 - 15 mm
- Q.6 For double angles connected back to back on both sides of a gusset plate, the net area is calculated using equation:
- $A_1 + A_2$
 - $A_1 + A_2 K$
 - $A_1 K + A_2$
 - $A_1 + A_2 / K$

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Q.7 For a strut consisting of two angles when placed back to back and connected to same side of a gusset plate by three bolts on both ends, the allowable axial compressive stress will be taken as:

- a) $0.85 S_{ac}$
- b) S_{ac}
- c) $0.75S_{ac}$
- d) $0.8S_{ac}$

Q.8 For a 4m long column is effectively held in position and restrained against rotation at the both ends. Its effective length will be :

- a) 3.20 m
- b) 4.00m
- c) 2.60m
- d) 2.00m

Q.9 For a simply supported beam of span 3.25m, the maximum possible deflection will be:

- a) 10mm
- b) 12mm
- c) 9mm
- d) 11mm

Q.10 From practical consideration, the width of last course in foundation for brick pillar should be equal to :

- a) Three times that of pillar in super-structure
- b) Twice the of pillar in super-structure
- c) Two and half times the of pillar in super-structure
- d) Equal ot the of pillar in super-structure

Section-B

Note: Objective type questions. All questions are compulsory.
(10x1=10)

Q.11 Define hardness.

Q.12 Define rivet value.

Q.13 The ultimate stress of bolt of grade 4.6 _____.

Q.14 Two plates of thickness 8mm and '12mm are joined by fillet weld. Find effective throat thickness.

Q.15 Work out gross area of a tension member when its ends are joined using rivets and carry 160kN load?

Q.16 Calculate axial compressive stress at slenderness ratio 95.56. When stress corresponding to l 100 and 110 is 80 and 72 respectively.

Q.17 Calculate moment of resistance of a rolled steel beam ISBM 500@852.5 when Z_{xx} is 1808.7×10^3 and permissible bending stress is 165 N/mm^2 .

Q.18 Define fabrication.

Q.19 Define rafter.

Q.20 Write the Rankin's formula to work out the depth of foundation under masonry walls.

Section-C

Note: Short answer type Question. Attempt any twelve questions out of fifteen Questions. (12x5=60)

Q.21 Briefly describe rolled steel sections and their uses.

Q.22 State the assumptions made in the analysis of riveted joints.

Q.23 Calculate the value 24mm diameter rivets used in a double cover butt joint. Thickness of main plates is 18mm and the thickness of each cover plates is 8mm. Take $T_{vf} = 90 \text{ N/mm}^2$, $S_{pf} = 300 \text{ Nmm}^2$ and $S_{at} = 150 \text{ N/mm}^2$.

Q.24 (a) How the size of a butt weld is specified? Explain.
(b) What is meant by effective throat thickness? Write effective throat thickness for :
(i) Partially penetrated Butt Weld
(ii) Fully Penetrated Butt Weld

Q.25 Two plates of size 160mm x 12mm and 180mm x 12mm joined by means of fillet welding, two side welds of 8mm and one end weld of 6mm. The length of overlap is kept at 120mm. Take tensile strength of fillet weld as 150N/mm^2 .

Q.26 An ISA 75x50x10 is connected to a gusset plate with its shorter leg using 18mm diameter rivets; calculate the strength of the tension member.

Q.27 (a) What do you mean by a tie? Explain.
(b) With the help of diagram, differentiate between the pitch of the rivets and the gauge distance.

Q.28 What is a tacking rivet? Discuss in brief what purpose it is used for.

Q.29 A single-angle Strut ISA 75x75x10 of a roof truss is 1.76 m long and is connected by one rivet at both ends. Calculate the safe load that the single-angle strut can carry.