

B.TECH.
(SEM VII) THEORY EXAMINATION 2022-23
DESIGN OF STEEL STRUCTURES

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.
IS800: 2007 & Steel Table Allowed

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

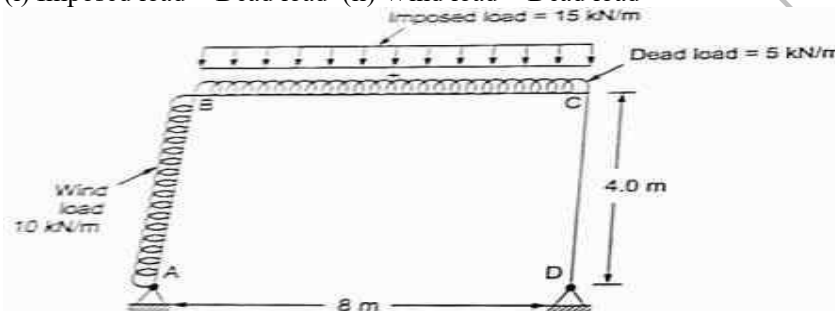
- (a) Give the five name of types of steel structure.
- (b) How you will be calculate wind load?
- (c) Draw pattern of riveted joint.
- (d) Write the assumptions of design of bearing type connections.
- (e) Which angle section are used in roof truss and why?
- (f) How efficiency can be increased in a tension member?
- (g) What assumptions made while designing a compression member?
- (h) Define lattice column with neat sketch
- (i) What do you know about slender cross section?
- (j) Define rafter.

SECTION B

2. Attempt any three of the following:

10 x 1 = 10

- (a) A frame shown in fig. is loaded by a dead load of 5 kN/m, imposed load of 15 kN/m and wind load of 10 kN/m. Calculate the greatest value of load for design of frame for the following conditions :
(i) Imposed load + Dead load (ii) Wind load + Dead load



- (b) Explain with neat sketches define types of butt weld. Also draw figure of typical fillet weld.
- (c) A single angle member carries a factored axial force of 400 kN. Design the member and the connections with a gusset plate and a lug angle. The yield strength and ultimate strength of the material is 250 MPa and 410 MPa, respectively.
- (d) Determine the design load on the column section ISMB450 @710.3 N/m, height of column to 4 mand it is pin-ended. Assume that $f_y = 250 \text{ N/mm}^2$, $f_u = 410 \text{ N/mm}^2$, $E = 2 \times 10^5 \text{ N/mm}^2$.
- (e) Explain with neat sketch recommended position of purlins.

SECTION C

3. Attempt any one part of the following:

10 x 1 = 10

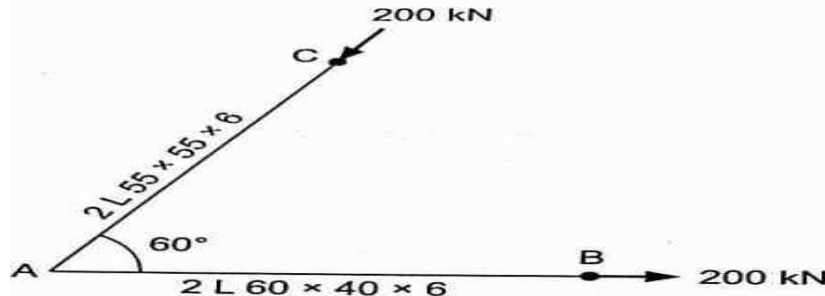
- (a) Write short notes on the following: (i) Notch toughness (ii) Fatigue strength (iii) Corrosion resistance
- (b) A tension bar 100 mm x 10 mm is to carry a load of 150 kN. A specimen of the same

quality of steel of cross sectional area 800 mm^2 was tested in the workshop. The maximum load carried by the specimen was 400 kN . Find the ultimate strength, factor of safety in the design and the gauge length.

4. Attempt any *one* part of the following:

10 x 1= 10

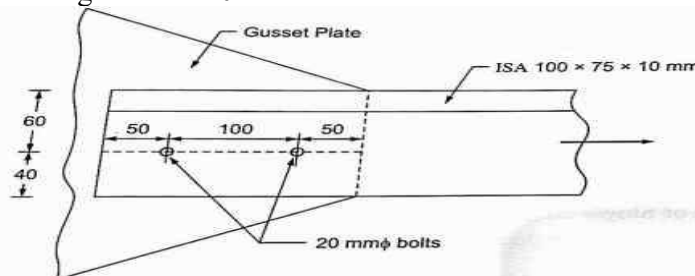
- Explain with neat sketch failure of bolted joint.
- Design a bolted connection of a truss joint as shown in figure. Using M16 black bolts of 4.6 grade and steel having $f_u = 410 \text{ N/mm}^2$. Use 10 mm thick bolt.



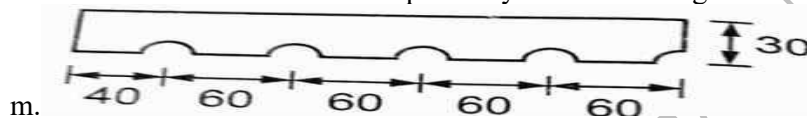
5. Attempt any *one* part of the following:

10 x 1= 10

- Determine the block shear strength of the tension member as shown in fig. Use the steel of grade Fe 410.



- Design a suitable single section to carry a factored tensile force of 210 kN assuming a single row of M20 bolts. The yield strength and ultimate strength of the material is 200 MPa and 410 MPa respectively. The length of the member is 3 m .



6. Attempt any *one* part of the following:

10 x 1= 10

- Find the expression for elastic buckling of slender compression member.
- Find the design compressive strength of two channels toe to toe. The column carries an axial factored load of 1500 kN . The effective height of the column is 10 m . Assume Fe415 grade steel.

7. Attempt any *one* part of the following:

10 x 1= 10

- Design a laterally supported simply supported beam of 4 m span, loaded for a concentrated load of 400 kN at mid span. The load is transferred through base plates of 200 mm length to the supports. Design a check for deflection using ISMB 400 section which is available.
- A simply supported beam of span 4.5 m consists of rolled steel section ISLB 450 @ 640 N/m . The compression flange is laterally unsupported. Determine the design strength of the beam.