

**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

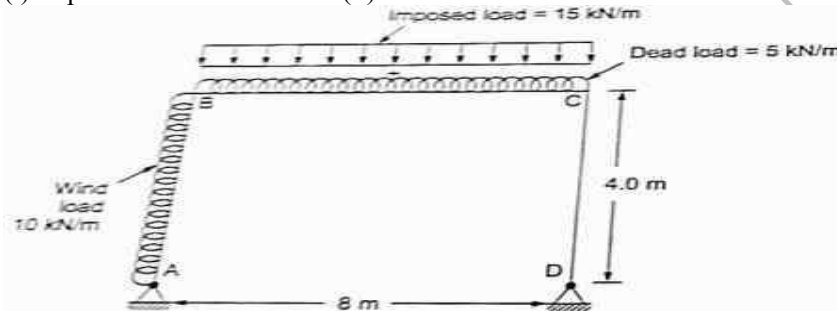
- (a) Give the five name of types of steel structure.
- (b) How you will be calculate wind load?
- (c) Draw pattern of riveted joint.
- (d) Write the assumptions of design of bearing type connections.
- (e) Which angle section are used in roof truss and why?
- (f) How efficiency can be increased in a 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 m and 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

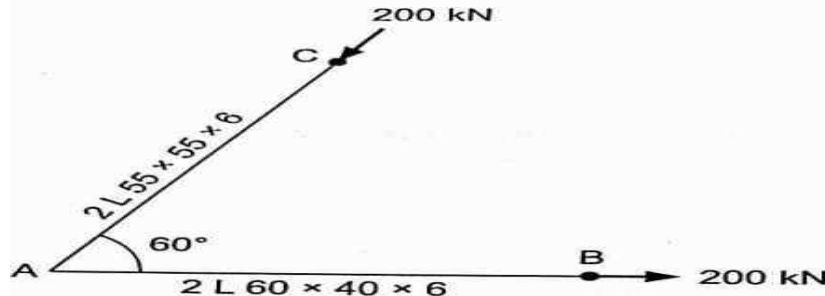
- (a) Write short notes on the following: (i) Notch toughness (ii) Fatigue strength (iii) Corrosion resistance
- (b) A tension bar 100 mm x 10 mm is to carry a load of 150 kN. A specimen of the same

quality of steel of cross sectional area  $800 \text{ mm}^2$  was tested in the workshop. The maximum load carried by the specimen was  $400 \text{ kN}$ . 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

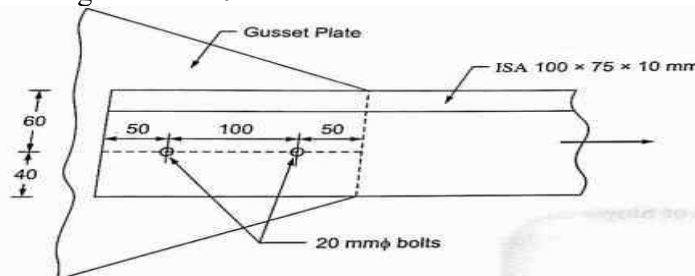
- Explain with neat sketch failure of bolted joint.
- Design a bolted connection of a truss joint as shown in figure. Using M16 black bolts of 4.6 grade and steel having  $f_u = 410 \text{ N/mm}^2$ . Use 10 mm thick bolt.



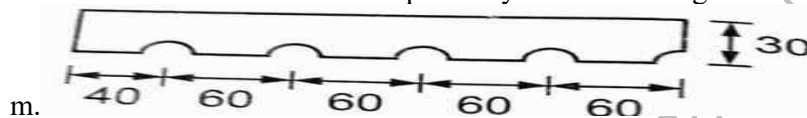
5. Attempt any *one* part of the following:

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  $210 \text{ kN}$  assuming a single row of M20 bolts. The yield strength and ultimate strength of the material is  $200 \text{ MPa}$  and  $410 \text{ MPa}$  respectively. The length of the member is  $3 \text{ m}$ .



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  $1500 \text{ kN}$ . The effective height of the column is  $10 \text{ m}$ . Assume Fe415 grade steel.

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

10 x 1= 10

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