



## BRAINWARE UNIVERSITY

Term End Examination 2023-2024

Programme – B.Tech.(CE)]-2021

Course Name – Design of Steel Structure

Course Code - PCC-CE601

( Semester VI )

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

### Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Identify the reason of important to consider the slip of connected members in bolted connections:
- |                               |                                                            |
|-------------------------------|------------------------------------------------------------|
| a) To prevent corrosion       | b) To reduce the length of the bolts                       |
| c) To ensure proper alignment | d) To maintain the integrity of the connection under loads |
- (ii) Identify the term preload in bolted connections refers to:
- |                                                                       |                                                              |
|-----------------------------------------------------------------------|--------------------------------------------------------------|
| a) The initial tension in the bolts before external loads are applied | b) The tension in the bolts after external loads are applied |
| c) The maximum tensile strength of the bolts                          | d) The yield strength of the bolts                           |
- (iii) Identify the term shear lag in bolted connections refers to:
- |                                                        |                                                                        |
|--------------------------------------------------------|------------------------------------------------------------------------|
| a) The reduction in strength due to eccentricity       | b) The non-uniform distribution of shear stress in a bolted connection |
| c) The deformation of the connected members under load | d) The tendency of bolts to slip under axial loads                     |
- (iv) Identify the primary purpose of using a flange plate in bolted connections:
- |                                                  |                                                  |
|--------------------------------------------------|--------------------------------------------------|
| a) To increase the aesthetic appeal              | b) To provide rotational flexibility             |
| c) To distribute forces to the connected members | d) To reduce the length of the connected members |
- (v) Identify the factor known as the reduction in the strength of a bolted connection due to the proximity of the edge:
- |                   |                       |
|-------------------|-----------------------|
| a) Edge factor    | b) Shear factor       |
| c) Spacing factor | d) Orientation factor |
- (vi) Select the type of welding joint is commonly used for connecting cylindrical parts:
- |               |                 |
|---------------|-----------------|
| a) Butt joint | b) Lap joint    |
| c) T-joint    | d) Fillet joint |
- (vii) Select the term welding position refers to in welding procedures:
- |                                              |                                        |
|----------------------------------------------|----------------------------------------|
| a) The location where welding is performed   | b) The orientation of the welded joint |
| c) The speed at which welding is carried out | d) The type of filler material used    |

- (viii) Select the meaning of the term intermittent weld in welding:
- a) A weld that is applied continuously along the entire length of the joint      b) A weld with periodic interruptions along the length of the joint  
 c) A weld with variable penetration depth      d) A weld that requires intermittent preheating
- (ix) Select the term duty cycle refers to in welding:
- a) The time a welder spends working on a project      b) The ratio of welding time to rest time for a welding machine  
 c) The number of welds performed in a given period      d) The temperature at which a weld is performed
- (x) Select the purpose of a chamfer in welding:
- a) To fill gaps between materials      b) To enhance corrosion resistance  
 c) To provide additional strength      d) To facilitate better penetration
- (xi) Choose the purpose of end connections in tension member design:
- a) Enhance axial capacity      b) Transmit loads to other members  
 c) Prevent buckling      d) All of these
- (xii) Choose the material property that is crucial for the design of tension members:
- a) Thermal conductivity      b) Electrical resistivity  
 c) Modulus of elasticity      d) Coefficient of expansion
- (xiii) Choose the primary function of a tension member in a structure:
- a) Support compressive loads      b) Transmit shear forces  
 c) Resist tensile forces      d) Provide lateral stability
- (xiv) Choose the primary concern in the design of slender compression members:
- a) Local buckling      b) Yielding  
 c) Axial deformation      d) Lateral torsional buckling
- (xv) Choose the type of connection that is commonly used in laced compression members to provide additional lateral support:
- a) Welded connection      b) Pinned connection  
 c) Bolted connection      d) Riveted connection

### Group-B

(Short Answer Type Questions)

3 x 5=15

2. Describe the failure criteria for steel. (3)
3. Write down the characteristics of the plastic section. (3)
4. Discuss the short note about the rolled steel section. (3)
5. Describe the properties of structural steel. (3)
6. Rivet connection is a mechanical fastening method. Justify the statement. (3)

OR

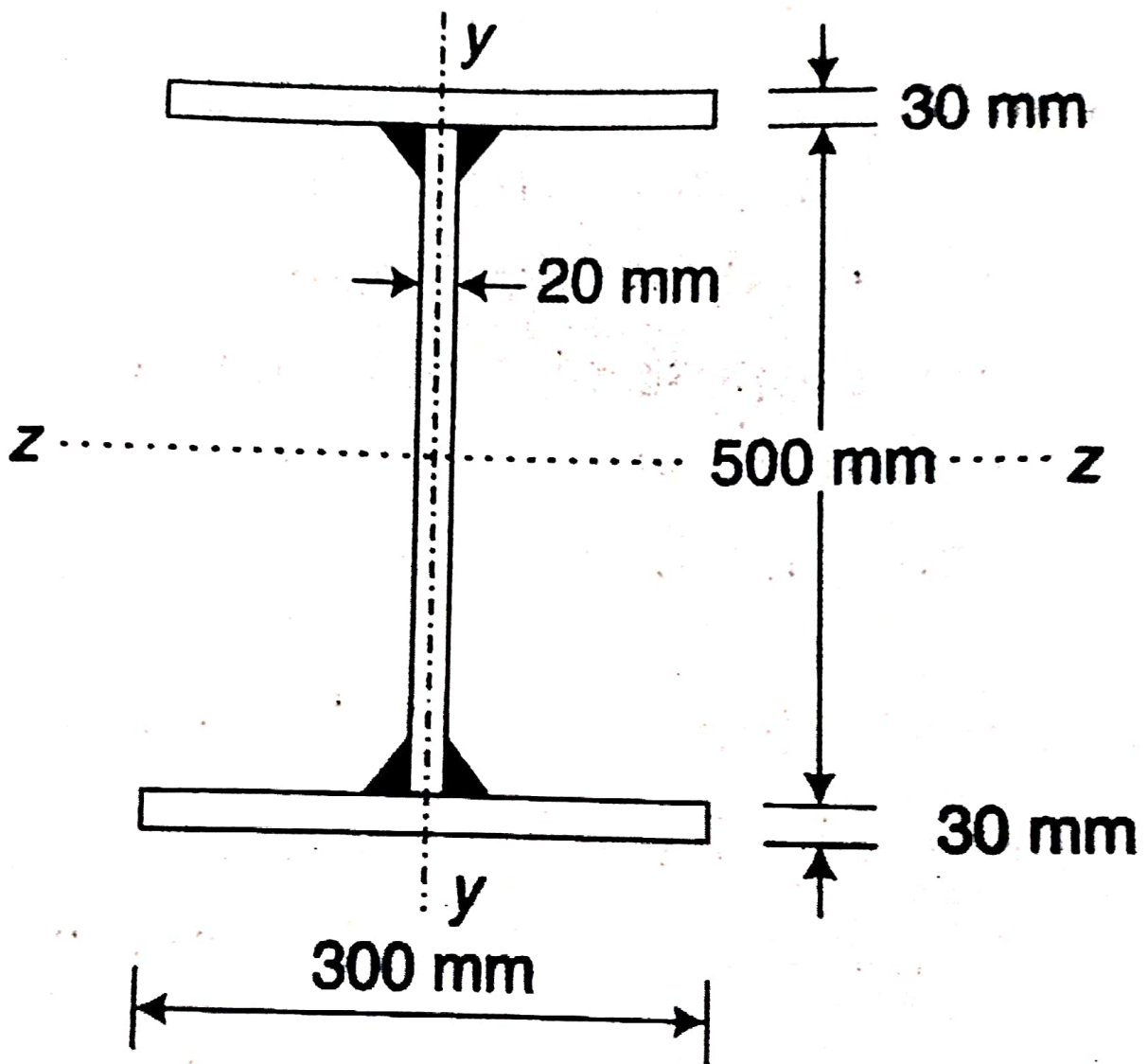
Evaluate the types of rivet connections. (3)

### Group-C

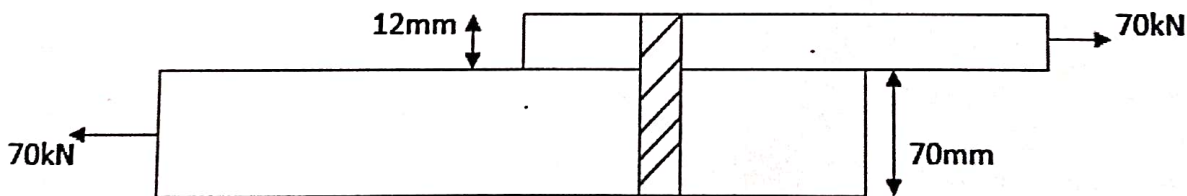
(Long Answer Type Questions)

5 x 6=30

7. For a column section built up of shape shown in Fig., express the axial load capacity in compression for the data indicated against the figure.  $f_y = 250$  MPa;  $L = 6.0$  m,  $t_w = 20$  mm,  $t_f = 30$  mm, End conditions: Both ends restrained in direction and position.,  $Y_{mf} = 1.50$ . (5)



8. Define the term ultimate tensile strength. (5)
9. Evaluate the number of bolts in a lap joint between two plates as shown in Fig. so as to transmit a factored (5) load of 70 kN. Using M16 bolts of grade 4.6 and grade 410 plates.



10. Write down the importance of ductility in plastic analysis. (5)
11. An I-section beam is fabricated with plates of following dimensions. (5)  
 Flanges: 380 x 20 mm  
 Web: 1600 x 15 mm

Classify flanges, web and the section. Also determine the plastic moment capacity of the beam about its strong axis, if the grade of steel is Fe 410.

12. Express the term Gantry Girder. (5)

**OR**

Write down the steps of Design of Stiffened Plate Girder. (5)

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