

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2693

Roll No.

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**B.Tech.**

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2012-13

**DESIGN OF STEEL STRUCTURES**

Time : 3 Hours

Total Marks : 100

**Note :** (i) Attempt all questions. Numerical accuracy is as important as procedure.

(ii) For analysis and design use Limit State Design method, following the recommendations given in IS : 800-2007. Use of this code is allowed.

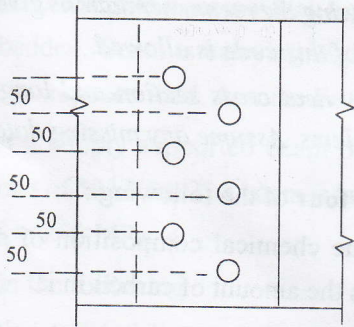
(iii) Draw neat cross section and longitudinal section in problems. Assume any missing data suitably.

1. Attempt any **four** of the following : (5×4=20)
- Give the chemical composition of structural steel and discuss the amount of carbon in it.
  - Give reasons why steel is more suitable than wood or concrete as structural material.
  - Sketch various types of rolled steel sections and show their conventional axes.
  - Draw a stress strain curve for mild steel and discuss salient points on it.
  - List various loads which are considered in design and discuss any two.
  - Discuss various limit states which are considered in design.

2. Attempt any **two** of the following : **(10×2=20)**

(a) A tie member of a truss consists of double angle section, each  $80 \text{ mm} \times 80 \text{ mm} \times 8 \text{ mm}$  welded on the opposite side of a  $12 \text{ mm}$  thick gusset plate at lower and upper side of the angle by  $5 \text{ mm}$  fillet weld in the workshop. Determine the length of welds at lower and upper side of angle if factored tensile load in the member is  $300 \text{ kN}$ .

(b) Determine the strength and efficiency of the lap joint shown in following Fig. 1. The bolts are of  $20 \text{ mm}$  diameter and of grade 4.6. The two plates to be joined are  $10 \text{ mm}$  and  $12 \text{ mm}$  thick of grade Fe-410.



**Fig. 1**

(c) Discuss the following :

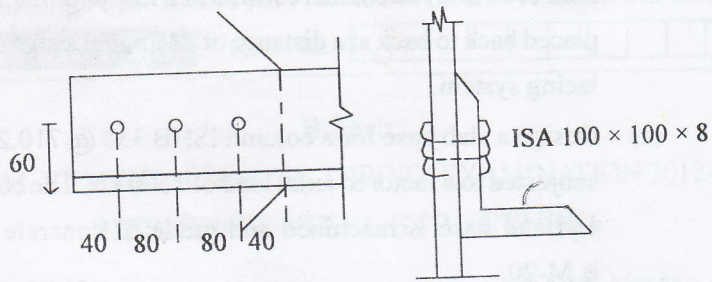
- (i) Prying action
- (ii) Advantages of fillet weld over butt weld
- (iii) Comparison of welded joints with bolted joints.

3. Attempt any **two** of the following : **(10×2=20)**

(a) Find tension carrying capacity of single angle  $ISA 100 \times 100 \times 8 \text{ mm}$  connected to gusset by three bolts of  $22 \text{ mm}$

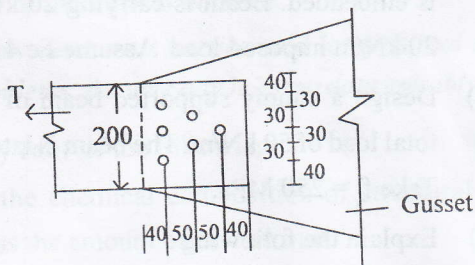
diameter at pitch of 80 mm c/c in one line as shown in fig. 2.

Take  $f_y = 250$  MPa and  $f_u = 410$  MPa.



**Fig. 2**

- (b) Determine the design tensile strength of plate 200 mm × 8 mm connected to 10 mm thick gusset using 20 mm bolts as shown in Fig. 3. Take  $f_y = 250$  MPa and  $f_u = 410$  MPa.



**Fig. 3**

- (c) Design a suitable angle section to carry tensile force of 250 kN. Use welded connection. 10
4. Attempt any **two** of the following : (10×2=20)
- (a) Calculate the design compressive load for a column made up of ISHB 350 @ 710.2 N/m and 3.5 m high. The column is restrained in direction and position at both the ends. Use steel of grade Fe-410.

- (b) A built up column is 10 m long and carrying a factored load 1080 kN. The column consists of 2 ISMC @ 351.2 N/m placed back to back at a distance of 185 mm. Design single lacing system.
- (c) Design a slab base for a column ISHB 350 @ 710.2 N/m subjected to a factored axial load of 1500 kN. The column end and base is machined and grade of concrete used is M-20.

5. Attempt any **two** of the following : (10×2=20)

- (a) Design a simply supported beam of span 4.2 m carrying a reinforced concrete floor in which top compression flange is embedded. Beam is carrying 20 kN/m dead load and 20 kN/m imposed load. Assume Fe 410 grade steel.
- (b) Design a simply supported beam of span 5 m to carry total load of 50 kN/m. The beam is laterally unsupported. Take  $f_y = 250$  MPa.
- (c) Explain the following :
  - (i) Local and lateral buckling of beam
  - (ii) Checks required for beam design.