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 No.

B. TECH.
(SEM VII) THEORY EXAMINATION 2017-18
DESIGN OF STEEL STRUCTURES

Time: 3 Hours

Total Marks: 100

- Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.
 2. IS 800:2007 original copy is allowed.

SECTION A

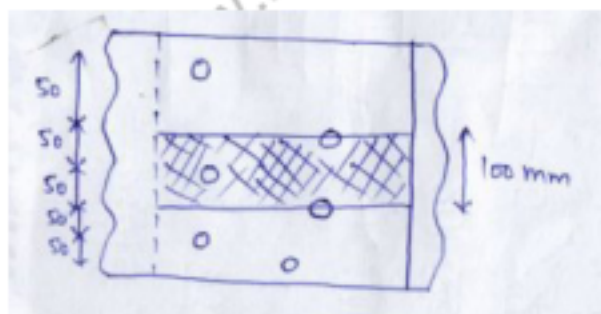
1. Attempt *all* questions in brief. **2 x 10 = 20**

- a. What are the partial safety factors for materials adopted by the code?
- b. What is the importance of wind load?
- c. Write any four assumptions made in the design of welded joints?
- d. What are the advantages of butt joints over lap joints?
- e. List out some of the tension members used in bridges and buildings.
- f. Define Gusset plate.
- g. What do you understand by buckling of column?
- h. Define splices.
- i. What do you mean by laterally restraint beam?
- j. What is local buckling of a beam member?

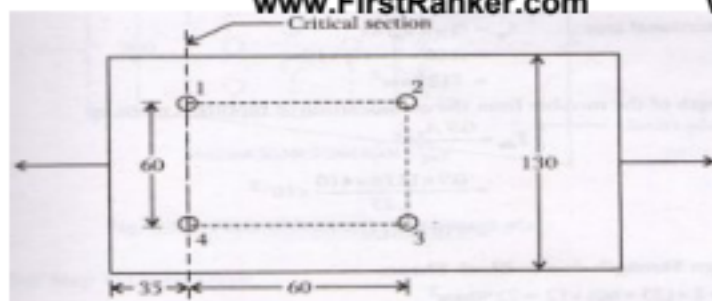
SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

- a. Distinguish between the working stress method, Ultimate strength design and limit state design.
- b. Determine the strength and efficiency of the lap joint shown in fig. the bolts are of 20 mm diameter and of grade 4.6. The two plates to be joined are 10 mm and 12mm thick and steel is of grade Fe-410.



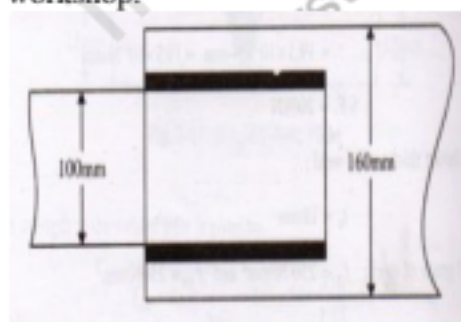
- c. Determine the design tensile strength of the plate 130mm*12 mm with the holes for 16 mm diameter bolts as shown in fig. Steel used is of Fe410 grade quality.



- d. Design a column section to be used in a public building. Column is 4.80 m long with both of its ends restrained in direction and position in zz as well as yy directions. The column is to support a factored load of 2500 kN.
- e. 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.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10
 - (a) What are the main objectives of a structural engineer while designing steel structure?
 - (b) Give the chemical composition of structural steel and discuss the amount of carbon in it. Sketch various types of rolled steel section and show their conventional axes.
4. Attempt any *one* part of the following: 10 x 1 = 10
 - (a) Discuss the following :
 - i. Prying action
 - ii. Advantages of fillet weld over butt weld
 - iii. (iii) Comparison of welded joints with bolted joints
 - (b) Design a suitable longitudinal fillet weld to connect the plates as shown in fig. to transmit a pull equal to full strength of small plate . Plates are to be 12 mm thick. Grade of steel plates to be used is Fe 410 and welding to be made in workshop.



5. Attempt any *one* part of the following: 10 x 1 = 10
 - (a) Determine the design tensile strength of plate 200 mm x 8 mm connected to 10 mm thick gusset using 20 mm bolts as shown in Fig. Take $f_y = 250$ MPa and $f_u = 410$ MPa.
 - (b) Find the tension carrying capacity of single angle ISA 100mm x 100mm x 8mm connected to gusset plate by means of three bolts of 22 mm diameter at a pitch of 80 mm c/c in one line . Use steel of grade Fe410 and bolts of grade 4.6.



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

10 x 1 = 10

- (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) With neat sketches , explain different types of the following :
 - i. Splices
 - ii. Base connections

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

10 x 1 = 10

- (a) A steel column ISHB 250@537N/m support a total factored load of 1000 kN. Design a slab base for the column. The column is supported on a pedestal made of M20 concrete.
- (b) Explain the following :
 - i. Local and lateral buckling of beam
 - ii. Checks required for beam design

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