Printed Pages: 7 NCE - 701

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

Paper ID : 2012209 Roll No.

B.TECH.

Regular Theory Examination (Odd Sem - VII), 2016-17

DESIGN OF STELL STRUCTURES

Time : 3 Hours *Max. Marks : 100*

SECTION - A

1. Attempt all parts. All parts carry equal marks.

Write answer of each part in short. (10×2=20)

a) Write any four advantages of steel on a structural material.

b) What is probabilitic basis for limit state Design method?

c) Define high tension bolts.

d) What is the concept of shear lag?

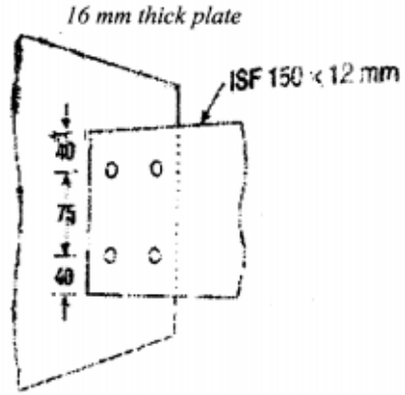
e) Write the expression to calculate the net area of cross section of a plate of width 'b' and thickness 't' and having staggered holes of pitch 'p' and gauge 'g'.

f) Write the defects in welded connection.
g) State the possible failure mode of an axially loaded column.
h) What is meant by slenderness ratio of a column?
i) Write the different sections of Plate Girder.
j) Define laterally unsupported beam? Give an example.

SECTION - B

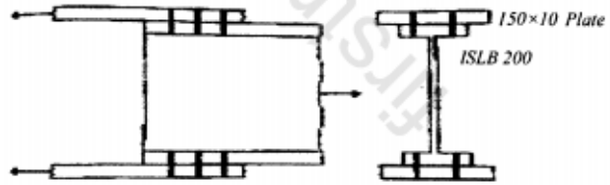
Note : Attempt any 5 questions from this section. **(5×10=50)**

2. The connection shown in fig. uses 20mm diameter 10.9S grade bolts with threads in the shear plane to connect an ISF 150 × 12mm with gusset plate. Determine the strength of the joint if (a) slip is not permitted (b) slip is permitted. Block shear strength of the joint need not be considered.



3. Design an angle section to carry a factored tensile load of 200kN. Bolts of 20mm diameter are to be provided for the connection of the member to the gusset plate. Take $f_y = 250N/mm^2$ and $f_u = 410\ N/mm^2$. The design strength of a 20mm diameter bolt = 45.3N.

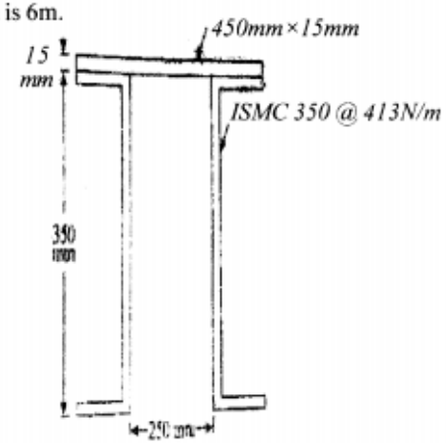
4. Two plates 150mm × 10mm are connected one over each flange of a beam ISLB 200@ 194.2N/m with 6 bolts of 16mm diameter as shown in fig. Determine the design tensile strength of (i) The beam ISLB 200 section (ii) The two plates.



5. Two plates 240mm × 12mm are to be connected in a double cover butt joint with 20mm diameter 4.6 grade bolts. The factored tensile load on the plates is 480kN. Design the connection. The cover plates are 8mm thick. The bolts have to be arranged in diamond pattern.

6. A 6m long column is made of a built - up section consisting of an ISHB 350@661.2N/m with a cover plate of 350mm × 20mm for each flange. The lower end of the column is restrained against translation and rotation while the upper end is pinned. Determine the design compressive strength of the column. Take $f_y = 250$ N/mm^2.

7. Determine the design compressive strength of the column whose section is shown in fig. The effective length of the column is 6m.



8. A simply supported beam of span 6m supports a reinforced concrete slab. The compression flange of the beam is restrained due to its connection with the slab. The beam is subjected to a dead load 25kN/m an an imposed load of 20kN/m. Design the beam. Assume the beam is sufficiently stiff against bearing.

9. Design a simply supported beam of span 3 meters. The beam is subjected to a factored bending moment of 250 kNm and a factored shear force of 120 kN. The beam is laterally unsupported.

SECTION - C

Note: Attempt any 2 questions from this section. **(2×15=30)**

10. a) Find the efficiency of a double bolted butt joint with double cover plates connecting two plates of 8mm thickness with 16mm diameter 4.6 grade bolts at a pitch of 50mm.

b) Design a single unequal angle strut 2.75m long between intersections for a factored compressive

load 60kN. The member is to be connected at each end to 10mm gusset plate with 20mm diameter bolts. Take $f_y = 250N/mm^2$.

11. a) A factored load of 150kN is applied to a bracket at an eccentricity of 350mm from the axis of a column. This load is transmitted to the flanges of the column with 2 rows of 20mm diameter bolts for each bracket plate. The rows are 120mm apart and the pitch of bolts is 75mm. Whether the design is safe or not.

b) A tension member of a truss consists of a single angle ISA 125 × 95 × 10 and is subjected to a factored tensile force of 450kN. Design the connection of the member to a gusset plate using a lug angle. Provide welded connection.

12. The following particulars refer to a trussed roof

Span of trusses	= 5m
Spacing of trusses	= 10m
Spacing	= 1.25m
Dead load of roof sheets	= 125kN/m²
Wind load	= 1800N/m² normal to roof

Design a purlin for the truss. Slope of roof = 30°.