

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), April-May 2016

B. Tech. in Civil Engineering, Semester VI



Roll No.....

CE607 : Design of Steel Structures

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. IS 800:2007 - General Construction in Steel -Code of Practice and steel Table is allowed in the exam.

Q.1A Objective type multiple choice questions (5 questions @ 1 mark)

10

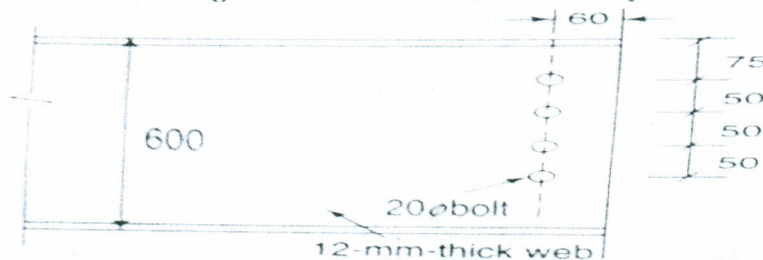
- i. The heaviest I-section for same depth is
A) ISMB B) ISLB C) ISHB D) ISWB
- ii. Minimum pitch of bolts shall not be less than (where d is gross diameter of bolt)
A) 1.5 d B) 2.0 d C) 2.5 d D) 3.0 d
- iii. In the cross-section of a weld, throat is the
A) minimum dimension B) average dimension
C) maximum dimension D) none of the above
- iv. The slenderness ratio of a column supported throughout its length by a masonry wall is
A) zero B) 10 C) 100 D) infinity
- v. The maximum slenderness ratio of a compression member carrying both dead and superimposed load is
A) 180 B) 200 C) 250 D) 350
- vi. If the 20 mm bolts are used in lacing bars, then the minimum width of lacing bar should be
A) 40mm B) 60mm C) 80mm D) 100mm
- vii. The web crippling due to excessive bearing stress can be avoided by
A) increasing the web thickness B) providing suitable stiffeners
C) increasing the length of bearing plates D) none of the above
- viii. What are the forces acting on lacing system -
A) transverse shear force B) axial force C) both D) none of them
- ix. Lacing bar in a column is designed to resist
A) bending moment due to 2.5% of column load
B) shear force due to 2.5% of column load
C) 2.5% of column load
D) Both A and B
- x. Shear area for circular hollow tube of uniform thickness is (where A - cross sectional area)
A) A/π B) $A/2\pi$ C) $2A/\pi$ D) πA

- Q.2 Short answer type questions (4 questions @ 2.5 marks)
- What are the loads considered on a gantry girder? Also, write criteria to obtain these loads. 2.5
 - Define gross area and net area of a section. 2.5
 - What do you understand by low fatigue condition? 2.5
 - What do you understand by plastic moment? 2.5

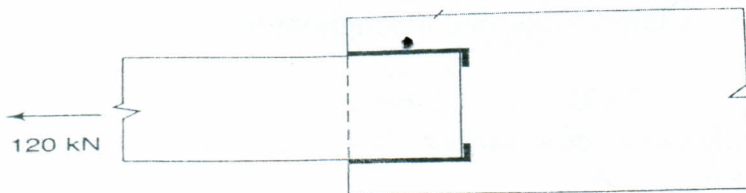
Q.3A Explain shear lag effect. 05

Q.3B Based on consequences of fatigue failure, classify the structural components. 05

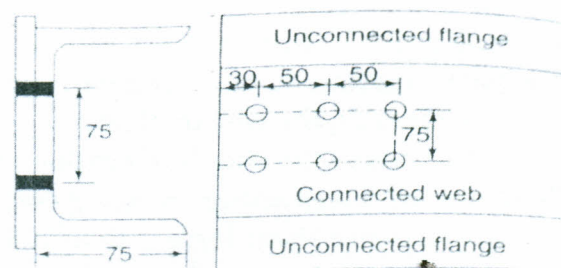
Q.4A An ISMB 600 is connected to a column by web cleats with a single row of bolts. 05
If the reaction is 350 kN and there are 4 bolts of 20 mm diameter through the web, as shown in fig, check if the section is adequate for block shear failure.



Q.4B Determine size and length of fillet weld for lap joint to transmit a factored load of 120 kN, as shown, assuming site weld, Fe 410 steel and 75 mm wide plate. 05

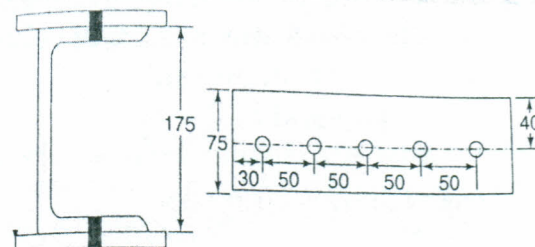


Q.5 Determine the tensile strength of an ISMC 175 when it is connected to a gusset plate through the web by two rows of 16 mm bolts with a connection length of 100 mm, as shown in figure. 10

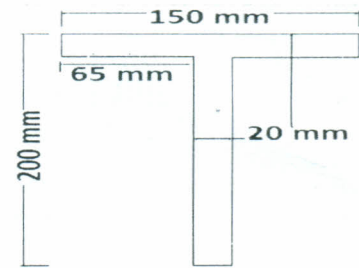


-OR-

Q.5 Determine the tensile strength of an ISMC 175 when it is connected to gusset plate through the two flanges by two rows of 16 mm bolts with a connection length of 200 mm, as shown in figure. 10



- Q.6 Find the location of plastic neutral axis and shear center of the section.



05

- Q.7A Design a double angle discontinuous strut to carry a factored load of 175 kN. The length of the strut is 3 m between intersections. The two angles are placed back to back on same side of the gusset plate and are tack bolted. Assume grade Fe 410 steel with $f_y = 250$ MPa. 05
- Q.7B Design a single angle discontinuous strut to carry a factored load of 65 kN. Assume that the distance between its joints is 2.5 m and is loaded through one leg. Use $f_y = 250$ MPa. 10
- Q.8 Design a simply supported beam of 7 m span carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The total UDL is made up of 100 kN dead load and 150 kN imposed load. In addition, the beam carries a point load at mid span made up of 50 kN dead load and 50 kN imposed load. Assume stiff bearing length of 75 mm and grade of steel is Fe 410. 15
- Q.9 Design cross section of gantry girder, without lateral restraint along its span, to be used in an industry carrying an overhead travelling crane for the following data: 15
- | | | |
|--|---|---------|
| c/c distance between columns | - | 7.5m |
| crane capacity | - | 200 kN |
| self wt. of crane girder (excluding trolley) | - | 200 kN |
| self weight of trolley | - | 40 kN |
| minimum hook approach | - | 1.2 m |
| distance between wheel centers | - | 3.5 m |
| c/c distance between rails | - | 15 m |
| self weight of rail | - | 300 N/m |
| yield stress of steel | - | 250 MPa |

