Total No. of printed pages = 7

END SEMESTER EXAMINATION – 2020

Subject Code : CT - 602

DESIGN OF STEEL STRUCTURE

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

PART – A

Marks – 25

1. Answer the following questions : 1×10=10

   (a) Define rigid connection.

   (b) Define pitch and gauge of a bolted connection.

   (c) List some of the tension members used in buildings and bridges.

   (d) Write the minimum edge distance in member with rolled edge.

   (e) What is meant by slenderness ratio ?

[Turn over

(f) What is buckling class of a solid section when the buckling is about z - z axis ?

(g) List the different modes of failure of a bolted connection.

(h) What do you mean by special fillet weld ?

(i) What is effective length of a column ?

(j) List the four types of weld.

2. Fill in the blanks : 1×8=8

(a) Minimum length of fillet weld should be _____ times the size of fillet weld.

(b) As per IS 800 : 2007, the diameter of bolt hole can exceed the diameter of the bolt having diameter larger than 24 mm by _____.

(c) The net tensile area of M16 bolt is _____.

(d) Design strength due to yielding of gross section is computed using the formula _____.

(e) The design compressive strength of an axially loaded compression member as per IS 800 : 2007 is based on _____.

(f) The maximum transverse pitch allowed in bolted tension member is _____.

(c) The minimum pitch distance in member is

(i) 2.5 bolt diameter

(ii) 1.5 bolt diameter

(iii) 2.0 bolt diameter

(iv) 1.7 bolt diameter

(d) The maximum longitudinal pitch allowed in bolted compression member is

(i) 16 times thickness of plate or 200 mm

(ii) 100 mm plus 4 thickness of plate or 150 mm

(iii) 150 mm plus 4 thickness of plate or 150 mm

(iv) 16 times diameter of bolt or 200 mm

(e) Which of the following is not a mode of failure in a tension member ?

(i) gross section yielding

(ii) net section rupture

(iii) local buckling

(iv) block shear failure

(f) In case of staggered pitch, pitch may be increased by

(i) 50% (ii) 20%

(iii) 100% (iv) 30%

(g) Rivets are no longer used in steel construction because

(i) they need pre heating

(ii) they require larger crew

(iii) of the high level of noise involved

(iv) All of these.

PART – B

Marks – 45

4. Define black bolt and high strength bolts. How are the bolts graded ? Discuss. Design a butt joint between two plates of size 100 × 12 mm thick and 100 × 16 mm thick so as to transmit a factored load of 150 kN using 16 mm diameter bolts of grade 4.6 and grade 410 plates. 3+6=9

5. The plates of 12 mm thick are connected by a double bolted butt joint with 24 mm diameter bolts. Calculate the efficiency of the joint assuming grade 4.6 bolts and Fe 410 plates. Differentiate between bolted connection and rivet connection. 6+3=9

6. What do you mean by welding? Discuss the various types of welding with figures. What are the advantages and disadvantages of welding over bolting? A tie member of a truss consisting of an angle section ISA 100 × 100 × 8 of Fe 410 grade, is welded to a gusset plate. Design a weld to transmit a load equal to the full strength of the member. Assume shop welding. 1+2+2+4=9

7. Explain the different types of failure of a tension member. A steel plate of size 200 × 12 mm is used as a tension member in a roof truss. It is connected to a gusset plate by 6 numbers of 20 mm diameter bolts having pitch distance 55 mm, end distance 40 mm and gauge distance of 120 mm. Calculate the tensile strength of the plate. 3+6=9

8. What do you mean by compression members ? Determine the design axial load on the column section ISMB 350, given that the height of column is 3.3 m and that it is pin ended. Also assume the following :

$f_y = 250$ MPa, $f_u = 410$ Mpa and $E = 2 \times 10^5$ MPa.

2+7=9