

Total number of printed pages-5

53 (CE 601) DGST-II

2018

## DESIGN OF STRUCTURE-II

Paper : CE 601

Full Marks : 100

Time : Three hours

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

*Answer any five questions.*

1. (a) Write short notes on rigid, simple and semi-rigid joints. Two plates 10 mm and 14 mm thick are to be jointed by double cover butt joint. Assuming cover plates of 8 mm thickness design the joint to transmit factored load of 300 kN. Assume Fe 410 plate and 16 mm diameter grade 4.6 bolt.

3+7=10

Contd.

(b) What are the advantages of bolted connections over riveted or welded connections? The plates of a tank 8 mm thick are connected by a single bolted lap joint with 20 mm diameter bolts at 50 mm pitch. Calculate the efficiency of the joint. Take  $f_u$  of plate as 410 MPa and assume grade 4.6 bolts.  
3+7=10

2. (a) List some of the important advantages of welding over bolting? Are there any disadvantages of using welding? What are they? List the four types of welds and define them.  
6

(b) What do you mean by groove weld? What are the various types of groove welds? What do you mean by partial penetration and full penetration groove weld? Which one is preferred and why?  
6

(c) The tie member of a truss is made of ISA 75 × 75 × 6 and is subjected to a factored tension load of 110 kN. The length of the angle is not enough to go from end to end and hence a splice has to be provided. Design a groove welded joint.  
8

3. (a) Define fillet weld. What do you mean by standard and special fillet welds? What are the different types of standard fillet welds? Show with diagrams (i) diagonal fillet weld, (ii) end fillet weld and (iii) side fillet weld. Write down the expression given in IS 800 to calculate the design strength of fillet welds.  
8

(b) Calculate the compressive resistance of a  $200 \times 200 \times 18$  angle assuming that the angle is loaded through only one leg, when  
12

(i) it is connected by two bolts at the ends

(ii) it is connected by one bolt at each end

(iii) connected by welding.  
12

4. Write short notes on block shear failure in plates and angles. The single angle ISA 100 75 10 is used as a tension member. It is connected to a 8 mm gusset plate and arrange with 6 numbers of 16 mm diameter bolts at a pitch of 50 mm and end distance of 30 mm. Calculate the strength of the angle when it is connected by:

(a) the long leg;  $g = 60$  mm

(b) the short leg;  $g = 40$  mm.

5+15=20



5. (a) Two plates of size  $120 \text{ mm} \times 12 \text{ mm}$  is welded to other by means of end fillet and two longitudinal fillets of size  $8 \text{ mm}$ . If the plate is loaded to its full strength, determine the required over-lapping length.

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- (b) Design a simply supported beam of  $7 \text{ m}$  span carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The total udl is made up of  $100 \text{ kN}$  dead load including self weight plus  $150 \text{ kN}$  imposed load. In addition, the beam carries a point load at midspan made up of  $50 \text{ kN}$  dead load and  $50 \text{ kN}$  imposed load, (assuming a stiff bearing length of  $75 \text{ mm}$ ).

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6. (a) A column consisting of ISHB 400 @  $77 \mu\text{N/m}$  has an unsupported length of  $4 \text{ m}$ . It is effectively held in position at both ends, but restrained against rotation at one end. Calculate the axial load the column can carry.

10

- (b) A bracket plate is welded to the flange of a column ISHB 200 as shown in figure 1. Check the safety of the joint.

10

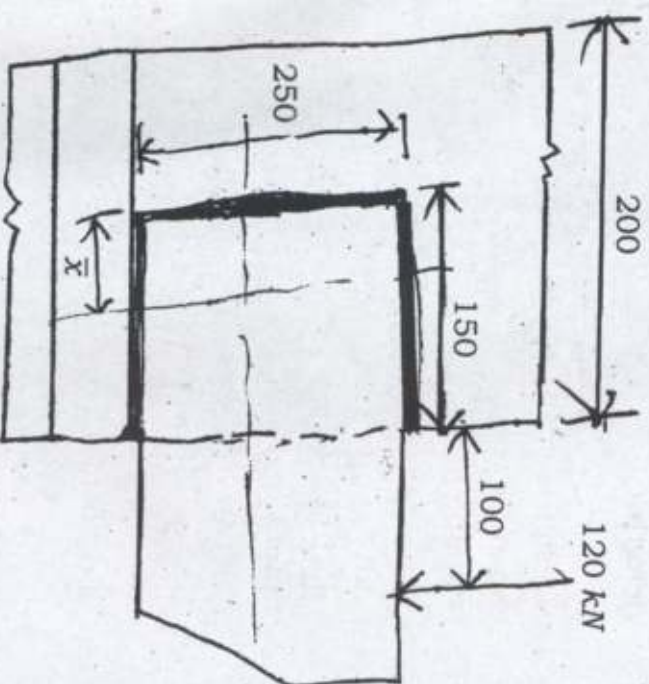


figure 1