Total number of printed pages–4

53 (CE 601) DGST–II

2021

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)* What are the advantages of bolted connections over riveted or welded connections ?

   A member of a truss consists of two angles ISA 65 × 65 × 6 placed back-to-back. It carries an ultimate tensile load of 125*kN* and is connected to a gusset plate 8*mm* thick placed in between the two connected legs. Determine the number of 16*mm* diameter grade 4·6 bolts required for the joint. Assume f_u of plate as 410 *MPa*. 2+8=10

Contd.

(b) What is the difference between a pitch and a staggered pitch?

Design a butt joint to connect two plates $200 \times 8mm$, Fe 410 grade using M 20 bolts. Arrange the bolts to give maximum efficiency. 2+8=10

2. (a) Design a bolted connection for a bracket carrying an eccentric load of $250kN$ at a distance $250mm$ from the centre line of an ISHB 300 @ $0{\cdot}588kN/m$.

Assume any missing data. Thickness of plate = $10mm$. 10

(b) Write short notes on : 2×5=10

(i) Rigid joint and semi-rigid joint

(ii) Pin connection

(iii) Efficiency of a joint

(iv) Black bolts

(v) Lap joint and Butt joint.

3. (a) Define fillet, groove, plug and slot welds with figures. Under what circumstances are slot and plug welds used? 5

(b) An ISMC 250 is used to transmit a factored force of 700kN. The channel section is connected to a gusset plate 10mm thick. Design a fillet weld if the overlap is limited to 300mm. Use plug and slot welds if required. 8

(c) A plate of size 120mm × 10mm is welded to other by means of end fillet and two longitudinal fillets of size of 8mm. If the plate is loaded to its full strengths, find out the required overlapping length. 7

4. Write notes on block shear failure in plates and angles. An unequal angle 1·5m long is connected to a gusset plate of thickness 8mm using 4mm size weld. Design the section for an ultimate load of 250kN. 20

5. Design a simply-supported beam of 7m span carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The total udl is made up of 150kN dead load including self-weight plus 200kN imposed load. In addition, the beam carries a point load at midspan made up of 75kN dead load and 50kN imposed load (assuming a stiff bearing length of 75mm). 20

6. What is the basic difference in behaviour between tension and compression members, while resisting the loads ?

Calculate the compressive resistance of a 200 × 200 × 18 angle assuming that the angle is loaded through only one leg, when —

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

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

(iii) it is welded at each end. 20