53 (CE 601) DGST–II

2017

DESIGN OF STRUCTURE–II

Paper : CE 601

Full Marks : 100

Time : Four hours

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

*Answer **any five** questions.*

1. *(a)* Write a detailed note on high tension friction grip bolted connection. Write the advantages of such connections. 5

   (b) The plates of a 6*mm* thick tank are connected by a single bolted lap joint with 20*mm* diameter bolts at 60*mm* pitch. Calculate the efficiency of the joint. Take f_u of plate as 410*MPa* and assume 4·6 grade bolts. 8

(c) Design a lap joint between two plates of size 100×16*mm* thick and 100×10*mm* thick so as to transmit a factored load of 100*kN* using a single row of M16 bolts of grade 4·6 and grade 410 plates. 7

2. (a) Write short notes on : 5

(i) Bolted connection

(ii) Welded connection.

(b) The single angle ISA 100 7510 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

(i) the long leg; g = 60*mm*

(ii) the short leg; g = 40*mm*. 15

3. (a) Design a bolted connection for a bracket carrying an eccentric load of 300*kN* at a distance of 200*mm* from the centre line of an ISHB 350 @ 67·4*kg/m*. Thickness of plate is 10*mm*; end distance = 40*mm*, pitch = 65*mm* and gauge distance = 60*mm*. 10

(b) Define with figures lap and butt joints. Design a butt joint to connect two plates 200×10*mm* of Fe 410 grade using M20 bolts. Arrange the bolts to give maximum of efficiency. 3+7=10

4. (a) Define fillet weld. What are the types of welds used in butt and lap joints ? What do you mean by standard and special fillet welds ? What are the different types of standard fillet welds ? Show with diagram diagonal fillet, end fillet and side fillet welds. 8

(b) Calculate the compressive resistance of a 200×200×20 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 connected by welding.

12

5. (a) Define slot and plug weld with figures. 3

(b) A 150*mm* × 16*mm* plate is welded to other plate by two side welds 120*mm* each and end fillet of 100*mm* length. Find the safe axial load in which this joint may be subjected if the size of the weld is 7*mm*. 7

(c) Determine the design axial load on the column section ISMB 350, given that the height of column is 3·0*m* and that it is pin-ended. Also assume the following : 10

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

6. (a) Write notes on block shear failurs in plates and angles. 5

(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

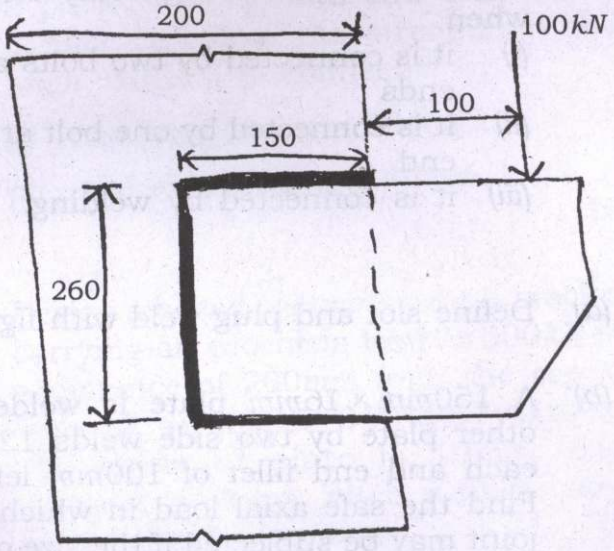

Figure 1

(c) Two plates of thickness 12*mm* and 10*mm* are to be joined by a groove weld. The joint is subjected to a factored tensile force of 150*kN*. Assuming an effective length of 150*mm*, check the safety of the joint for cases *(i)* single *V* groove weld joint and *(ii)* double *V* groove weld joint. Assume Fe 410 grade steel plates are used and that the welds are slope welded. 5
