53 (CE 601) DGST-II

2019

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 ***all*** *questions.*

1. What is the basic goal of a connection design ? What are the advantages of bolted connections over riveted or welded connections ? 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. Also assuming the same parameters as above, design the joint if it is to be jointed by lap joint. 1+4+8+7=20

Contd.

2. *(i)* Write short notes on :

(a) Lap joint

(b) Butt joint

What are the advantages of butt joints over lap joints? 6

(ii) Design a bolted connection for a bracket carrying an eccentric load of 250*kN* at a distance of 150*mm* from the centre line of an ISHB 350 @ 67·4*kg/m*. Thickness of plate is 10*mm*, end/edge distance = 40*mm*, pitch = 65*mm* and gauge distance = 60*mm*. Assume suitable value for any other missing data. 10

(iii) Define efficiency of a joint. Why does the bolt bearing capacity not often control the design? 2+2=4

3. *(i)* Define groove and fillet welds. What are the various types of groove welds? 5

(ii) What do you mean by partial penetration and full penetration groove weld? Which one is preferred and why? 3

(iii) Under what circumstances are slot and plug welds used? 2

(iv) An ISMC 250 is used to transmit a factored force of 700*kN*. The channel section is connected to a gusset plate of 10*mm* thick. Design a fillet weld if the overlap is limited to 300*mm* and width of plate is 250*mm*. Use slot welds if required. Assume any missing data. 10

4. *(i)* A column consisting of ISMB 350 has an unsupported length of 3·2*m*. It is effectively held in position at both ends but restrained against rotation at one end. Calculate the axial load this column can carry. 10

(ii) Design a simply supporting 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 including self weight plus 150*kN* imposed load. In addition, the beam carries a point load at midspan made up of 50*kN* dead load and 50*kN* imposed load, assuming a stiff bearing length of 75*mm*. 10

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5. Write short notes on block shear failure in plates and angles.

An unequal angle 1·5*m* long is connected to a gusset plate of 8*mm* thickness using 4*mm* weld. Design the section for an ultimate load of 250*kN*. 5+15=20