Total number of printed pages: **Programme(D)/6th Semester/DCE 602**

2025

Design of steel Structure

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1.	a)	List some of the bolts that are used in structural connections and define them. Write short notes on i) Lap joint and ii) Butt joint. What are the advantages of Butt joint over Lap joint?	4+3+3=10
	b)	Two plates of 12 mm thick are to be joint by using 20 mm diameter bolts of grade 4.6 in i) Lap joint, ii) Double cover Butt joint. Determine the bolt value in each case	10
2.	a)	Define efficiency of a joint. 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.	2+8=10
	b)	How do you determine the resultant force in a bolted bracket connection? Design a bolted connection for a bracket carrying an eccentric load of 180 kN at a distance of 200 mm from the centre line of an ISHB 350 @ O.588 kN/m. The thickness of the plate is 12 mm. Assume grade 4.6 bolt and Fe 410 steel. Take pitch = 50 mm and edge distance = 35 mm. Assume any missing datas.	2+8 = 10
3.	a)	Define Groove and fillet weld. What are the advantages and disadvantages of a fillet weld? Design a suitable longitudinal fillet weld and end fillet to connect 180 X 12 mm plate to 200 X 14 mm plate to transmit a pull equal to the full strength of the small plate. Assume welding is to be done in the field. Use Fe 410 grade steel.	2+3+5=10
	b)	Write short notes on Slot and Plug weld. An ISMC 350 is used to transmit a factored force of 750 kN. The channel section is connected to a gusset plate of 14 mm thick. Design the fillet weld if the overlap is limited to 250 mm. Use slot welds if required	5+5=10
4.		Write short notes on i) Design strength due to rupture of critical section and ii) design strength due to block shear failure. The single angle ISA 1007510	6+14 =20.

		is used as a tension member. It is connected to a 8 mm gusset plate and arrange with 6 numbers of 24 mm diameter bolts at a pitch of 60 mm and end distance of 30 mm. Calculate the design strength of the angle when it is connected to i) the long leg, g = 60mm ii) the short leg, g = 40mm.	
5.		Define effective length, buckling and slenderness ratio of a compression member. Determine the design axial load on the column section ISMB 350. The height of the column is 6.0 m and it is effectively restrained at mid height by a bracing member in the Z-Z direction, but is free to move in the Y-Y direction and both the ends of the column are hinged. Assume Fe 410 grade steel and E = 2 X 10^5 MPa. Also determine the design axial load from table 9 of IS 800 :2007 and compare the result.	5+15=20
6.		Calculate the compressive resistance of a 200X200X18 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 Assume that the member has a length of 3.0 m and Fe 410 plate.	20