PVP 20

Code: 20CE3601

III B.Tech - II Semester – Regular Examinations – JUNE 2023

DESIGN OF STEEL STRUCTURES
(CIVIL ENGINEERING)

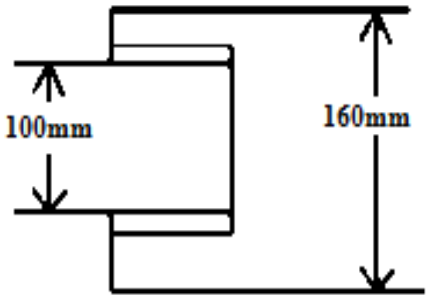
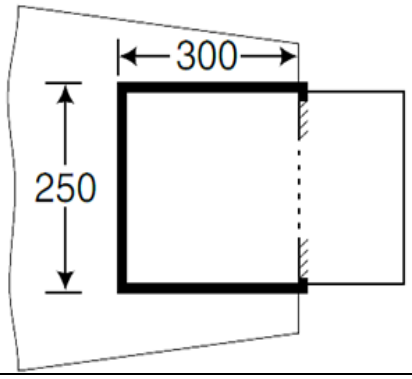
Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

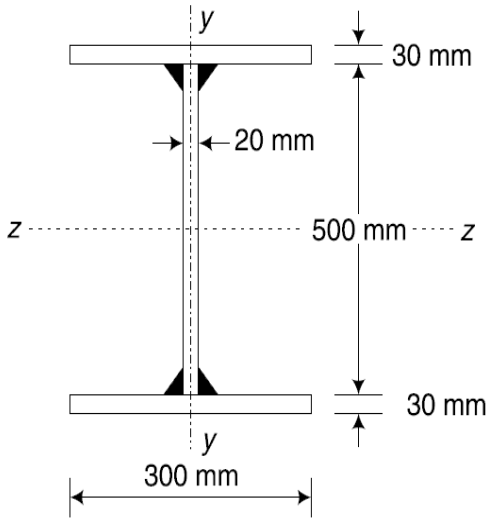
BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
UNIT-I					
1	a)	During erection of beam of a steel building, a plate of 180 x 20 mm welded to column, is bolted butt connected to the plate of 180 x 20 mm welded to the beam. Evaluate the connection strength and also the efficiency of the butt joint. Given M20 bolts of grade 4.6 and Fe410 (E250) plates are used. Butt-joint is made using two cover plates each of size 12mm and 6 numbers of bolts on each side.	L2	CO1	9 M
	b)	The loads on a floor beam of a commercial building are as below. Roof loads: Dead load = 6 kN/m^2, Live load = 4 kN/m^2, Roof finish = 1.5 kN/m^2 Determine the design load for: (i) Limit state of strength. (ii) Limit state of serviceability.	L2	CO1	5 M
OR					
2	a)	Two ISF sections 250 mm x 12 mm each and 1.5 m long are to be joined to make a	L2	CO1	7 M

		member of length 3.0 m. Design a butt joint with the bolts arranged in the diamond pattern. The flats are supposed to carry a factored force of 350 kN. Assume steel of grade Fe 410 and 20 mm diameter bolts of grade 4.6 to make the connections.			
	b)	Two flats each 300 mm x 8 mm, are to be joined using 20 mm diameter, 4.6 grade bolts to form a lap joint for a top chord of the steel truss. The joint is supposed to transfer a factored load of 250 kN. Design the joint and determine suitable pitch for the bolts. Assume Fe 410 grade of steel.	L2	CO1	7 M
UNIT-II					
3	a)	Two plates of 16 mm and 14 mm thickness are to be joined by a groove weld. The joint is subjected to a factored tensile force of 430 kN. Due to some reasons the effective length of the weld that could be provided was 175 mm only. Check the safety of the joint. if (i) Single-V groove weld is provided (ii) Double-V groove weld is provided. Assume the plates to be shop welded and grade of steel Fe 410	L3	CO2	7 M
	b)	A beam ISLC 300 @ 331N/m is used to transmit a force of 500kN. The channel section is connected to a gusset plate of 8mm thick. Design the suitable fillet weld if the overlap is limited to 350mm. Assume grade of steel Fe 410.	L3	CO2	7 M
OR					

4	a)	Design a suitable longitudinal fillet weld to connect the plates as shown in figure, to transmit a pull equal to full strength of small plate of 12mm thick and grade of the plates Fe410 and welding to be made in workshop.  	L3	CO2	7 M
	b)	A tie member in a truss girder is 250 mm × 14 mm in size. It is welded to a 10-mm thick gusset plate by a fillet weld. The overlap of the member is 300 mm and the weld size is 6 mm. Determine the design strength of the joint, if the welding is done as shown in figure. What is the increase in strength of the joint, if welding is done all-around? Assume shop welding and grade of steel Fe 410.  	L3	CO2	7 M
		UNIT-III			
5		A 3 m long Tension Member of bottom chord for a roof truss is to carry a factored tensile load of 250 kN. Use Fe410 grade of steel. The bolts	L3	CO3	14 M

	to be used are of grade 4.6 and of 20 mm diameter. i) Design a Tension Member for the bottom chord. The section should consist of single angle and is subjected to reversal of stresses due to the action of wind and design the bolted connections for the member. ii) Check the member considered is safe against the load applied.			
	OR			
6	A tension member 0.95 m long is to resist a service dead load of 20 kN and a service live load of 60 kN. Design a rectangular bar of standard structural steel of grade Fe 410. Assume that the member is connected by one line of 16 mm diameter bolts of grade 4.6.	L3	CO3	14 M
	UNIT-IV			
7	In a technical steel building for a heavy industry, design a Built-up column with two channels back to back along with lacing system of column length 10 m subjected to carry an axial factored load of 1350 kN. The columns are restrained in position but not in direction at both ends. Assume steel of grade Fe 410 and bolts of grade 4.6. i) Design Compression Built-up section for the given load. ii) Evaluate the spacing between the channels and dimensions of the lacing system and design the connecting lacing system with bolted connections.	L3	CO4	14 M

		OR			
8	a)	A column in a building is to be retrofitted for enhancement of the load. Determine the axial load capacity for the column section in compression for a built up of shape shown in Fig. for the data indicated against the figure. End conditions: Both ends restrained in direction and position. f_y = 250 MPa L = 6.0 m t_w = 20 mm t_f = 30 mm γ_{ml} = 1.50 	L3	CO4	7 M
	b)	Design a column to support a factored load of 1050 kN. The column has an effective length of 7.0 m with respect to z-axis and 5.0 m with respect to y-axis. Use steel of grade Fe 410.	L3	CO4	7 M
		UNIT-V			
9		A simply supported steel joist of 4.0 m effective span is laterally supported throughout. It carries a total uniformly distributed load of 10 kN/m (inclusive of self-weight). Design an appropriate section using steel of grade Fe 410.	L3	CO5	14 M

	OR			
10	Design a steel beam section for supporting roof of a big hall for the following data and apply the usual checks. Assume steel of grade Fe 410. Clear Span: 6.5 m End bearings: 150 mm c/c spacing of beams: 3 m Imposed load on the beam: 10 kN/m^2 Dead load (inclusive of self-weight): 4 kN/m^2 Restriction on beam depth: 375 mm The compression flange of the beam is laterally supported throughout.	L3	CO5	14 M