PVP 20

Code: 20CE3601

III B.Tech - II Semester – Regular / Supplementary Examinations
APRIL 2024

DESIGN OF STEEL STRUCTURES
(CIVIL ENGINEERING)

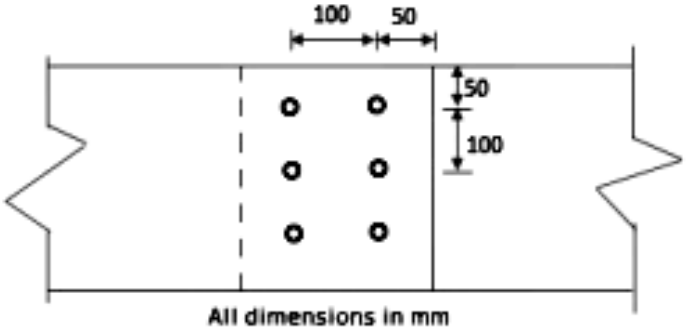
Duration: 3 hours Max. Marks: 70

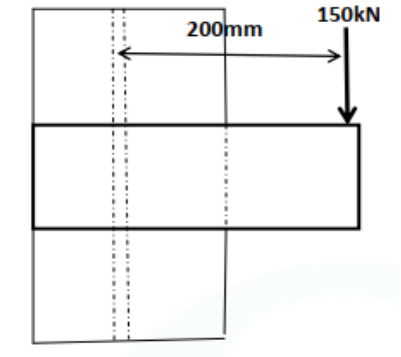
Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

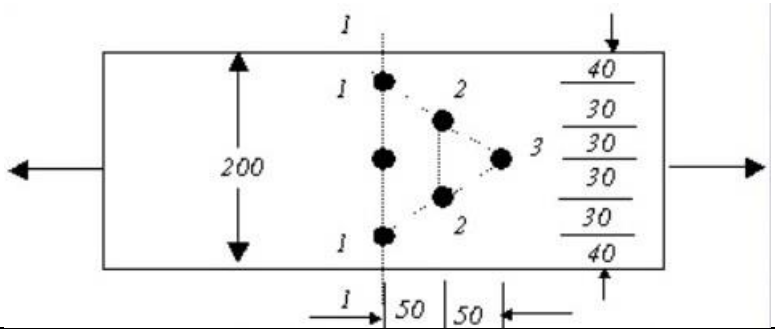
BL – Blooms Level CO – Course Outcome

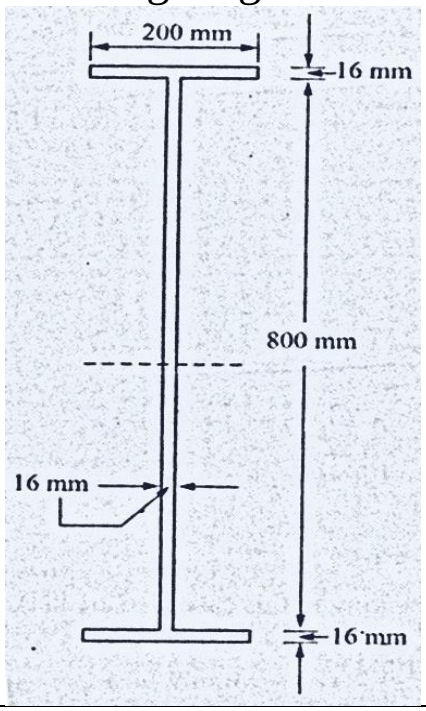
Assume the required data

Use IS:800 – 2007 Code Book and Steel Tables

			BL	CO	Max. Marks
		UNIT-I			
1	a)	Sketch and briefly explain any three failure patterns of bolted connection.	L2	CO1	4 M
	b)	Determine the strength and efficiency of a bolted lap joint shown in figure. The bolts are of 20mm diameter, grade 4.6. The plates are of 12mm thick and grade Fe410. 	L3	CO1	10 M
		OR			
2	a)	Differentiate between bearing type connection & friction type connection.	L2	CO1	4 M
	b)	Design a double cover butt joint between the two plates of width 300 mm, if the thickness of one plate is 18 mm and the other is 10 mm. The joint has to transfer a working load of	L6	CO1	10 M

		260 kN. The plates are of Fe 410 grade. Use bolt of grade 4.6.			
UNIT-II					
3	a)	A tie member of a roof truss consisting of an angle section ISA 75 x75x10 of Fe 410 grade, is welded to a 10mm thick gusset plate. Design a weld to transmit a load equal to full strength of the member. Assume shop welding.	L6	CO2	7 M
	b)	An ISMC 250 @ 298kg/m is used as a tie member to transmit a factored load of 800kN. The channel section is connected to a gusset plate of 10mm thickness. Design a fillet weld if the lap length is limited to 300mm. Provide slot welds if required.	L6	CO2	7 M
OR					
4	a)	Under what circumstances do we use slot welds and plug welds?	L2	CO2	4 M
	b)	Design the bracket connection shown below. The connection supports a load of 150kN. The column section is ISHB 150@ 300.19N/m. The thickness of bracket plate is 10mm. Use welded connection. 	L6	CO2	10 M
UNIT-III					
5	a)	Explain the purpose of lug angles in tension member connection.	L2	CO3	4 M
	b)	Determine the design tensile strength of the plate 200 x 10mm with the holes as shown	L6	CO3	10 M

		below if the yield strength and ultimate strength of steel are 250MPa and 410MPa. M20 bolts and 10mm thick gusset plates are used. 			
		OR			
6	a)	Explain block shear failure.	L2	CO3	4 M
	b)	Determine the tensile strength of ISA 125 x 95 x 8 mm connected to the gusset plate of 10mm through the shorter leg by 4, M20 bolts arranged in one row. The grade of steel is Fe410. Take p = 65 mm, Edge & End distance = 40mm.	L5	CO3	10 M
		UNIT-IV			
7	a)	Explain the failure modes of axially loaded columns.	L2	CO4	2 M
	b)	Design a column 10 m long to carry a factored axial load of 1100kN. The column is restrained in position but not in direction at both ends. Design a batten system for the column. Assume that the two channels are kept back to back.	L6	CO4	12 M
		OR			
8		Design a built-up column consisting of two channels placed back to back to carry an axial factored load of 1900kN. Design bolted single lacing system also. Length of the column is 10m and both the ends of the column are effectively restrained in direction and position.	L6	CO4	14 M

		UNIT-V			
9	a)	What is lateral stability of beams?	L2	CO5	2 M
	b)	Determine the uniformly distributed load carrying capacity of the girder shown in figure, when it is used as a simply supported beam of 4 m effective span and check it for shear, web buckling and web crippling. Assume stiff bearing length as 100 mm. 	L6	CO5	12 M
		OR			
10	a)	Explain the classification of cross sections as per the IS 800: 2007 based on yield and plastic moments & rotational capacities.	L2	CO5	4 M
	b)	Design a simply supported beam of 10m effective span carrying a total factored load of 60kN/m. The depth of beam should not exceed 500mm. The compression flange of beam is laterally supported by floor construction.	L6	CO5	10 M