

B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER – 2025**SUBJECT: Design of structures-II****Time: 3 hours****Full Marks: 100****Use Separate Answer scripts for each part
(50 marks for each part)****Answer all questions**

Assume reasonable values of any data if required. The notations have their usual meaning. IS 800, IS-875, and SP-6 are allowed in the examination hall. Assume E250 grade of steel.

Part – I

Q. No.	Question	CO	Marks
1	A 20 m X 50 m factory shed is to be constructed at Durgapur. The steel roof trusses are to be used for roofing supported on the concrete columns. The spacing of the roof truss is 5 m and the span of the truss is 20m. The column height above GL is 6 m. The galvanized corrugated iron sheet will be used. The maximum spacing of the purlin is 1.5 m. Propose a suitable type of roof truss and calculate the wind load acting at the nodal point for both the wind direction (parallel and perpendicular to ridge) for the design.	[CO1]	20
2	The design member forces of the vertical member (nodal length of 2.5m) in a typically pitched roof truss of a factory shed are as follows: Compressive force (factored) = 100 KN (DL + WL) Tensile force (factored) = 110 KN (DL + LL) Design the member using a single angle section having a gusset plate of thickness of 12 mm. Use limit state method of design. Assume 3 bolts of 12 mm dia of 4.6 grade at each end. Edge distance = 40 mm and pitch = 40 mm.	[CO2]	15
3	Determine the weld size needed for the connection as shown in the fig 3.	[CO3]	15

[Turn over

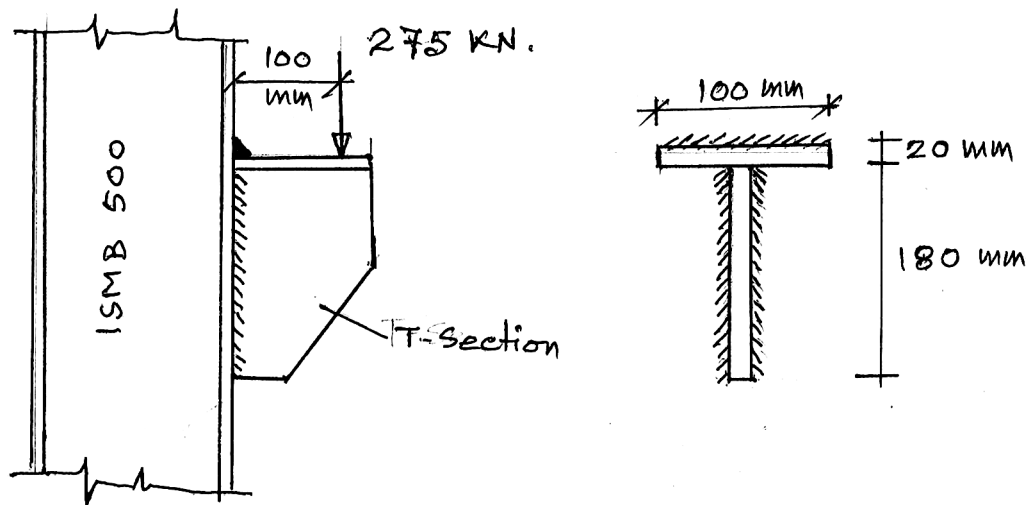


Fig-3.

B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER EXAM 2025**Subject: DESIGN OF STRUCTURES II****Full Marks 100**
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No. of Questions	<u>PART II</u>	Marks
	[Use of I.S. 800 and SP-6(1) are allowed in the examination hall.] (Consider Fe410/E250 grade of steel i.e. 'yield stress' of steel = 250MPa) <u>Group- A (Answer ANY ONE from Q1 and Q2)</u> Q1. A steel floor beam is simply supported over a span of 5.75m. It is subjected to one concentrated load of magnitude 165kN (D.L.+ L.L.) acting at mid-span of the beam in addition to its self-weight. Design a rolled steel ISMB-section for this beam if the compression flange of the beam is 'NOT laterally restrained or NOT supported' along its length. Stiff bearing length is 200mm. Show all checks except web bearing and web buckling checks. Assume any reasonable data, if required. 2. Design a rolled steel ISMC section, under 'dead load, live load and wind load (suction)' combination, for a purlin member in an industrial shed having the following data: a) Angle of truss = 24°; b) Spacing of truss = 4.9 m c/c; c) Span of truss = 36.0 m; d) Spacing of purlins = 1.52 m c/c; e) Net intensity of wind pressure = 1.52 kN/m²; f) Weight of galvanized sheet = 150 N/m², g) Intensity of live load = 0.47 kN/m². Assume any reasonable data, if required. <u>Group- B (Answer ANY ONE from Q3 and Q4)</u> 3.a) An ISMB 600 @ 122.6 kg/m has been used as a column of effective length 4.1m about both the axes. Calculate the design axial strength (P_a) of the column considering the major axis and minor axis buckling of the column separately. From these, find the actual axial load carrying capacity of the column. 3.b) Design a suitable 'bolted or welded gusseted base plate' for the above mentioned column (in Q.3a) if it subjected to maximum axial load as calculated above. The base plate is to rest on a concrete pedestal having the safe bearing capacity of 9.0MPa. Assume any reasonable data, if required. Draw a neat sketch to show the details of the column with base-plate. Use 20mm diameter bolts of grade 4.6 having A_{nb} = 245mm² for bolted connection and 'shop weld' for welded connection.	[20] [20] [10] [20]

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No. of Questions	<u>PART II</u>	Marks
4.a) [CO:5] .b) [CO:6]	A column made of ISMB 600 @ 122.6 kg/m is hinged at both the ends. Its effective length is 4.8m. It is subjected to factored axial compressive load of 1625kN and a factored moment of 70kNm about its major axis at both the ends. The moment remains unchanged throughout the length of the column. Check whether the column section is safe or not. Write short note on 'base plate, its types and its uses' in steel design. === E N D ===	[25] [5]