Ref. No.: **Ex/CE/PC/B/T/323/2023**

B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER – 2023

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.

Part – I

Q. No.	Question	CO	Marks
1	A 22 m X 54 m factory shed is to be constructed at Jamshedpur. The steel roof trusses are to be used for roofing supported on the concrete columns. The spacing of the roof truss is 6 m and the span of the truss is 22m. The column height above GL is 6m. The galvanized corrugated iron sheet will be used. The maximum spacing of the purlin is 1.4 m. Propose a suitable type of roof truss and calculate the wind load acting at the nodal point for the design.	[CO1]	25
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) = 200 KN (DL + WL) Tensile force (factored) = 225 KN (DL + LL) Design the member using a double angle section having a gusset plate of thickness of 10 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 maximum load P (factored) that could be resisted by the bracket as shown in fig 3.	[CO3]	10

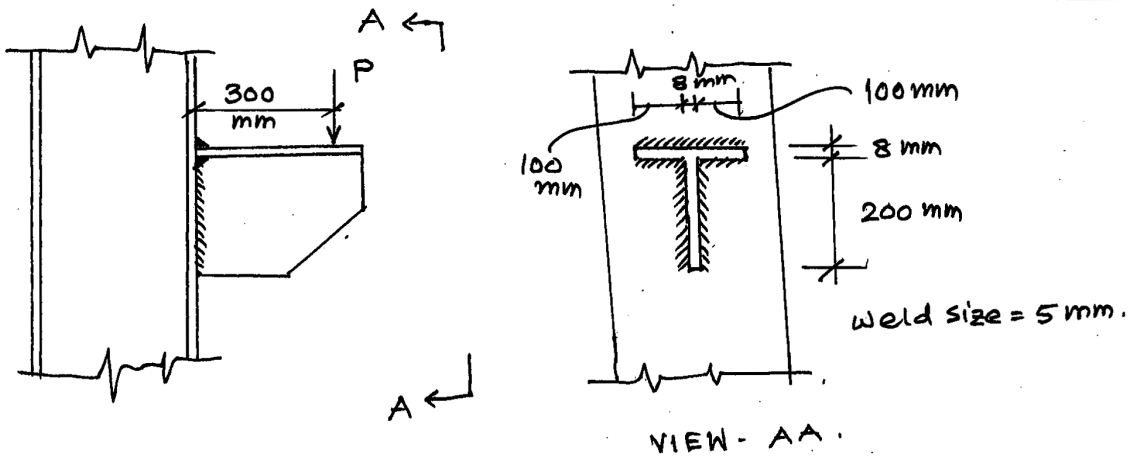

Fig - 3.

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B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER EXAM 2023

Subject: DESIGN OF STRUCTURES II

Full Marks 100
(50 marks for each part)

Time: **Three hours**

Use a separate Answer-Script for each part

No. of Questions	**PART II**	Marks
	[Use of I.S. 800 and SP-6(1) are allowed in the examination hall.] (Consider Fe410 steel i.e. 'yield stress' of steel = 250MPa) **Answer [Q1 or Q2], Q3 and Q4**	
Q1. [CO:4]	A steel floor beam is simply supported over a span of **5.25m**. It is subjected to **one concentrated load** of magnitude **50kN** (D.L.+ L.L.) acting at mid-span **of the beam** and a uniformly distributed load of intensity of **32kN/m** acting over the entire span of the beam. 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. Assume any reasonable data, if required.	[30]
2. [CO:4]	Design a rolled steel **ISMC section**, under '**dead load and wind load (suction)**' and '**dead load, live load and wind load (thrust)**' combination, for a purlin member in an industrial shed having the following data: a) Angle of truss = $\mathbf{18^0}$; b) Spacing of truss = **4.0 m** c/c; c) Span of truss = **28.0 m**; d) Spacing of purlins = **1.6 m** c/c; e) Net intensity of wind pressure = **1.7 kN/m^2**; f) Weight of galvanized sheet = **150 N/m^2**, g) Intensity of live load = **0.45 kN/m^2**. Assume any reasonable data, if required.	[30]
3.a) [CO:5]	An **ISMB 450 @72.4kg/m** has been used as a column of effective length **5m** about both the axes. Calculate the load carrying capacity ($\mathbf{P_d}$) of the column.	[5]
3.b) [CO:6]	Design a suitable 'bolted / 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} = 245mm^2 for bolted connection and 'shop weld' for welded connection. ===END===	[15]