Ref. No.: Ex/CE/PC/B/T/411/2024

B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER – 2024

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 20 m X 50 m factory shed is to be constructed at Jamshedpur. The steel roof trusses are to be used for roofing supported on the steel columns. The spacing of the roof truss is 5 m c/c and the span of the truss is 20m. The column height above GL is 8 m. 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. Calculate the nodal forces due to **dead and live load** acting at the nodal point for the design. Show the nodal forces with proper diagram	[CO1]	20
2	A vertical member (**ISA 80x80x8**) in a roof truss of nodal length 2.5m is connected with the gusset plate of thickness 10mm at the end with two bolts (4.6 grade) of diameter 12mm at each end. The edge distance and the pitch of the bolts are 40 mm. Determine the compressive and the tensile load (factored) carrying capacity of the member. Use limit state method of design. The grade of structural steel is E250BR	[CO2]	15
3	Determine the suitable weld size for the bracket connection as shown in fig 3.	[CO3]	15

[Turn over

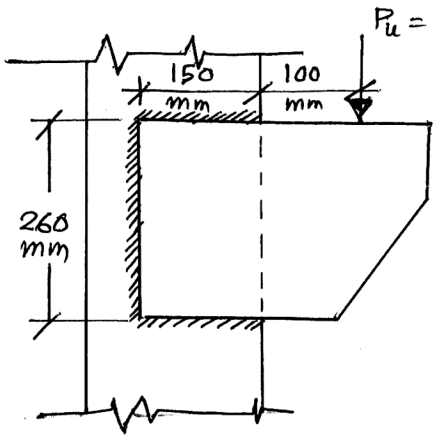

Fig - 3

Ref. No. **Ex/CE/PC/B/T/323/2024**

B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER EXAM 2024

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)	
	Group- A (Answer ANY ONE from Q1 and Q2)	
Q1. [CO:4]	A steel floor beam is simply supported over a span of **4.8m**. It is subjected to **one concentrated load** of magnitude **75kN** (D.L.+ L.L.) acting at mid-span **of the beam** and a uniformly distributed load of intensity of **25kN/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 **except web bearing and web buckling checks**. Assume any reasonable data, if required.	[20]
2. [CO:4]	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 = **20^0**; b) Spacing of truss = **4.6 m** c/c; c) Span of truss = **32.0 m**; d) Spacing of purlins = **1.45 m** c/c; e) Net intensity of wind pressure = **1.35 kN/m^2**; f) Weight of galvanized sheet = **150 N/m^2**, g) Intensity of live load = **0.42 kN/m^2**. Assume any reasonable data, if required.	[20]
	Group- B (Answer ANY ONE from Q3 and Q4)	
3.a) [CO:5]	A column made of **ISMB 500 @ 86.9 kg/m** is hinged at both the ends. Its effective length is **4.0m**. It is subjected to factored **axial compressive load** of **900kN** and a **factored moment** of **45kNm** 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.	[25]
3.b) [CO:6]	i) Explain why 'base plate' is needed to be provided below the steel column. ii) Describe the types of base plates that are generally used in steel construction.	[5]

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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
	(contd. from page 1)	
4.a) [CO:5]	An **ISMB 550 @103.7kg/m** has been used as a column of effective length **5.5m** about both the axes. Calculate the design axial strength (P_d) 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.	[10]
4.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.	[20]
	===END===	