Form A : Paper-setting Blank

Ref. No. ...*EX/CE/5/T/403/2019(Old)*

BACHELOR OF ENGINEERING (CIVIL ENGINEERING) FOURTH YEAR
FIRST SEMESTER EXAM 2019 (Old)

SUBJECT .....*Design of Metal Structures -I*

Full Marks 100
(50 marks for part I)

Time: Three hours

Use a separate Answer-Script for each part

No. of Questions	PART I	Marks
	Assume reasonable data if not given, IS 800, IS875, Section Hand Book are allowed in the examination hall	
	Answer any two questions	
1)	Calculate nodal wind forces on the truss shown in Fig. 1 and the wind pressure on the walls as per IS:875, part-III of the factory shed with the following dimensions: i) Location----Kolkata ii) Span of truss ---16m iii) Spacing of truss----2.8m iv) Number of truss----8 v) Height of eves from GL---10m	25
2.a)	A tie member of truss consisting an angle section ISA 75×75×6 of Fe410 grade is welded to 8mm gusset plate. Design a weld to transmit a factored load of 150kN. Assume shop weld.	10
b)	Design a bolted torsion-shear bracketed connection to carry a factored vertical load of 250kN. The load is acting at a distance 350mm from the centre of the column. The cross section of the column is ISMB450@72.4kg/m.	15
3)	The forces in the member **PQ** of the truss as shown in Fig. 1 are as follows: Design the member using double angles and calculate the number of bolts. Assume that the longitudinal members are placed at alternative nodes. Use Limit State Method of design.	25

Member PQ	DL	LL	WL
	105 kN (T)	90 kN (T)	235 kN (C)

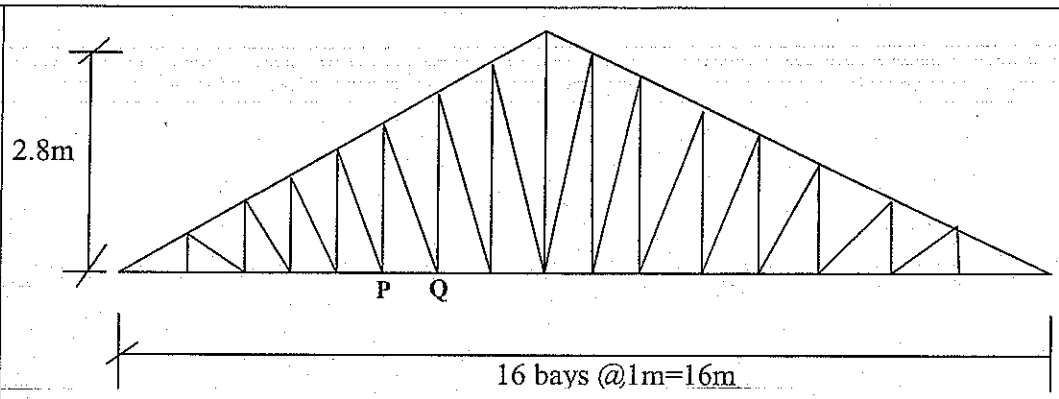

Fig. 1

.....*B.E.(CIVIL ENGINEERING) 4th Year 1st Semester [OLD]*..... EXAMINATION, *2019*

SUBJECT ..... ***Design of Metal Structures - I*** .....

PAPER .....

Full Marks 100

Time: ~~Two hours~~/**Three hours**/~~Four hours/Six hours~~ **(50 marks for each part)**

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 any TWO questions	
1.	A steel floor beam is simply supported over a span of 5.5m. It is subjected to uniformly distributed load of intensity 25kN/m (D.L.+L.L.) acting over its entire length. Design a rolled steel **ISMB-section** for this beam if the compression flange of the beam is **laterally unrestrained / unsupported** along its length. Consider stiff bearing length as 150mm. Show all checks. Assume any reasonable data, if required.	25
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 = 22^0; b) Spacing of truss = 5.0 m c/c; c) Span of truss = 18.0 m; d) Spacing of purlins = 1.5 m c/c; e) Net intensity of wind pressure = 1.6 kN/m^2; f) Weight of galvanized sheet = 150 N/m^2, g) Intensity of live load = 0.60 kN/m^2. Also check whether the section is safe under '**dead load, live load and wind load (thrust)**' combination. Assume any reasonable data, if required.	25
3.	A column made of **ISMB 450 @ 72.4 kg/m** is hinged at both the ends. Its effective length is 4.5m. It is subjected to factored axial compressive load of 1600kN and a factored moment of 100kNm about its major axis at both the ends. Check whether the column section is safe or not.	25
4.	a) An **ISMB 600 @122.6kg/m** has been used as a column of effective length 4.5m. Calculate the load carrying capacity (P_d) of the column. b) Design a suitable '**bolted / welded gusseted base plate**' for the above mentioned column 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 24mm diameter bolts of grade 4.6 having A_{nb} = 353mm^2 for bolted connection and 'shop weld' for welded connection.	25
	= = = E N D = = =	