B.C.E Examination ,2018

3rd year, 2nd semester ref Ex/CE/T/325/2018 (Old)

Design of Metal structures-I

Time 3 hours Full Marks 100

Use separate answer script for each part

(50 marks for each part)

Part –1

Answer any two questions

Assume reasonable values of any data if required

IS 800, IS-875 and SP-6 are allowed in the examination hall

Q 1 Design member forces of a rafter member in a roof truss of a factory shed are as follows:

Compressive force (factored) = 300 KN (DL + LL)

Tensile force (Factored) = 260 KN (DL + WL)

Design the member using double angle section. Nodal distance of the rafter member is 1.75 m. Assume weld connection. Use limit state method of design. **25**

Q 2 (a) What are the advantages of HFSG bolt over Black bolt?

(b) Explain with diagram "BLOCK SHEAR FAILURE"

(c) Determine the maximum d required for the bracket as shown in Fig Q 2 based on connection design . Size of the fillet weld is 6mm (shop) **3+2+ 20**

Q3. A 20 m X60m factory shed is to be constructed at Jalpaiguri. The steel roof trusses are to be used for roofing on the concrete columns. The spacing of the roof truss is 5 m and span of the truss is 20m. Column height above GL is 5 m. Galvanised corrugated iron sheet will be used. Maximum spacing of the purlin is 1.8m. Propose a suitable type of roof truss and calculate the dead load and live load acting at the nodal point for the design. **25**

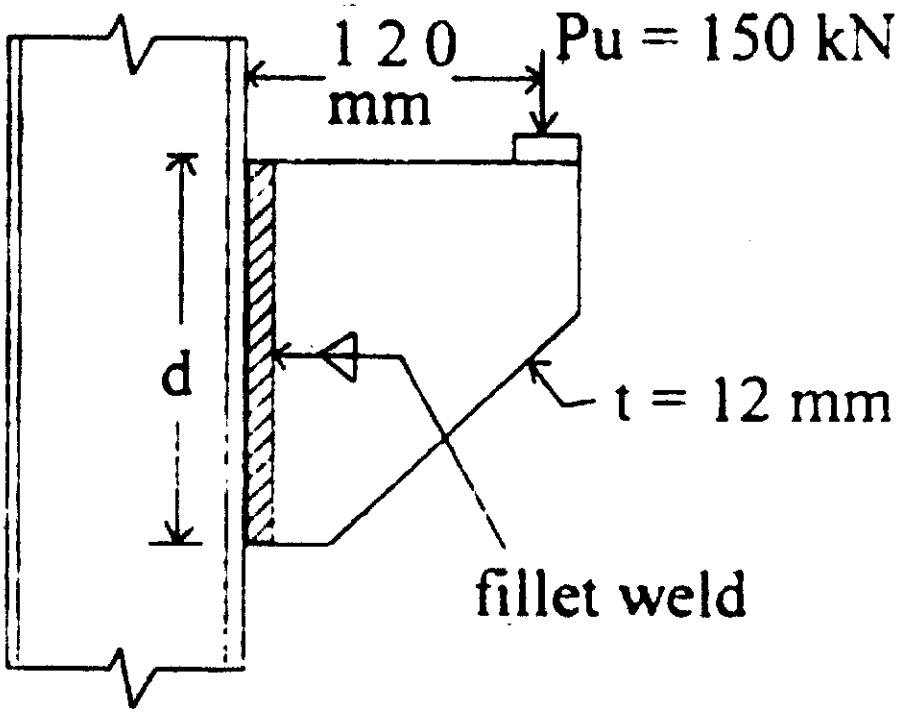

Fig Q 2

Form A : Paper-setting Blank

Ref. No.*Ex/CE/T/325/2018(OLD)*

.....*B..E. Civil Engineering 3rd Year 2nd Semester (OLD)*..... EXAMINATION, *2018*

SUBJECT ..... ***Design of Metal Structures - I*** .....
(Name in full)

PAPER .....–.....

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 any TWO questions**	
1.	A steel floor beam is simply supported over a span of **6m**. It is subjected to uniformly distributed load of intensity **40kN/m** acting over its entire length and a concentrated load of magnitude **110kN** acting at its mid-span. Design a rolled steel I-section for this beam if the compression flange of the beam is '**not laterally supported or restrained**' along its length. Show all checks. Assume any reasonable data, if required.	[25]
2.	Design a rolled steel channel section, under '**dead load and wind load (thrust)**' combination, for a purlin member in an industrial shed having the following data: Spacing of truss = **4m** c/c Span of truss = **20.0** m Spacing of purlins = **1.5m** c/c Angle of truss = $\mathbf{21.5^0}$ Net intensity of wind pressure = $\mathbf{1.7\ KN/m^2}$ Weight of galvanized sheet = $\mathbf{150\ N/m^2}$ Assume any reasonable data, if required.	[25]
3.	A column made of **ISMB 500 @ 86.9 kg/m** is hinged at both the ends. Its effective length is **5.0m**. It is subjected to factored axial compressive load of **650kKN** and a factored moment of **80kNm** about its major axis at both the ends. Check whether the column section is safe or not.	[25]
4.	a) Design a column with **rolled steel I-section** to support a factored axial load of **1300 kN**. The column has an effective length of **5.5m** with respect to both major and minor axis of the cross-section. b) Design a suitable base plate for the above mentioned column. The base plate is to rest on a concrete pedestal having the safe bearing capacity of $\mathbf{9.0N/mm^2}$. Assume any reasonable data, if required. Draw a neat sketch to show the details of the column with base-plate.	[25]
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