Form A : Paper-setting Blank

Ref. No. ...*EX/CE/5/T/403/2018(S)(OLD)*

.....*Bachelor of Civil Engineering (Civil Engineering) 4th Year*... EXAMINATION, *2018(OLD)*
(1st / 2nd Semester / ~~Repeat /~~ Supplementary ~~/ Annual / Bi-Annual~~)

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

PAPER .....*XX*.....

Full Marks 100
(50 marks for part ~~II~~ I

Time: ~~Two hours~~/Three hours/~~Four hours/Six 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) a)	A single angle (100×100×8) is connected to the gusset plate at the ends with 4 nos 20φ bolts to transfer tensile force. Determine the design tensile strength of the angle assuming f_y=250MPa and f_u=410MPa. Use Limit State Method of design.	17
b)	A tie member of truss consisting an angle section ISA 65×65×8 of Fe410 grade is welded to 8mm gusset plate. Design a weld to transmit a factored load of 250kN. Assume shop weld.	8
2.a)	Design a double angle discontinuous strut to carry a factored compressive load of 255kN. The length of the strut is 3.25m between the intersections. The two angles are placed back to back and are tack bolted. Use Limit State Method of design.	10
b)	The member forces in a joint (Fig. 1) of a roof truss is given in the table below. Design the joint using M16 bolt of class 4.6. The thickness of gusset is 8mm.	15

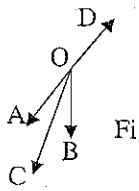

Fig. 1

Member	OA(Rafter)	OD(Rafter)	OC(Inclined)	OB(Vertical)
Force from DL and LL combination	190kN(C)	160kN(C)	24kN(T)	35kN(C)
Section provided	2 nos 65×65×8	2 nos 65×65×8	1 nos 60×60×8	1 nos 60×60×8

3.a)	Design a bolted torsion-shear bracketed connection to carry a factored vertical load of 280kN. The load is acting at a distance 525mm from the centre of the column. The cross section of the column is ISMB450@72.4kg/m.	17
b)	Calculate design wind pressure, external and internal pressure coefficients as per IS:875, part-3 on the wall of the factory shed with the following dimensions: i) Location----Kolkata ii) Length ---48m iii) Span of truss/width of building--25m iv) Height of eves from GL---12m v) Pitch ---1/5	8

..B.E.Civil Engineering [Evening] 4th Year 1st Semester (Supplementary)[OLD].. EXAMINATION, *2018*

SUBJECT ..... *DESIGN OF METAL STRUCTURES-I*.....

PAPER .....

Full Marks 100

Time: **Three 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 **4.0m**. It is subjected to uniformly distributed load of intensity **30kN/m** (D.L.+L.L.) acting over entire span of the beam. Design a rolled steel I-section (**ISMB section**) for this beam if the compression flange of the beam is **laterally unrestrained / laterally unsupported** along its length. Consider stiff bearing length as 125mm. Show all checks. Assume any reasonable data, if required.	25
2.	Design a rolled steel channel section (**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 = 23.0^0; b) Spacing of truss = 4.5 m c/c; c) Span of truss = 25.0 m; d) Spacing of purlins = 1.65 m c/c; e) Net intensity of wind pressure = 1.75 kN/m^2; f) Weight of galvanized sheet = 150 N/m^2, g) Intensity of live load = 0.5 kN/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 **4.5m**. It is subjected to factored axial compressive load of **1200kN** and a factored moment of **70kNm** about its major axis at both the ends. Check whether the column section is safe or not.	25
4.	a) An **ISMB 550 @103.7kg/m** has been used as a column of effective length **5.5m**. 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
	===END===	