

.....**B.E.(CIVIL ENGINEERING) 4<sup>th</sup> Year 1<sup>st</sup> Semester**..... EXAMINATION, 2019

SUBJECT ..... **Design of Structures - II** .....

PAPER .....

Full Marks 100  
(50 marks for each part)

Time: ~~Two hours~~/**Three hours**/~~Four hours~~/~~Six hours~~

Use a separate Answer-Script for each part

No. of Questions	PART I	Marks
	<p>[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)</p> <p><b><u>Answer any TWO questions</u></b></p>	
1.	<p>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 and one concentrated load of magnitude 50kN (D.L.+L.L.) acting at mid span of the beam. Design a rolled steel <b>ISMB-section</b> for this beam if the compression flange of the beam is <b>laterally unrestrained / unsupported</b> along its length. Consider stiff bearing length as 150mm. Show all checks. Assume any reasonable data, if required.</p>	25
2.	<p>Design a rolled steel <b>ISMC section</b>, 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 = 21°; b) Spacing of truss = 5.0 m c/c; c) Span of truss = 18.0 m; d) Spacing of purlins = 1.6 m c/c; e) Net intensity of wind pressure = 1.7 kN/m<sup>2</sup>; f) Weight of galvanized sheet = 150 N/m<sup>2</sup>, g) Intensity of live load = 0.65 kN/m<sup>2</sup>. Also check whether the section is safe under 'dead load, live load and wind load (thrust)' combination. Assume any reasonable data, if required.</p>	25
3.	<p>A column made of <b>ISMB 450 @ 72.4 kg/m</b> is hinged at both the ends. Its effective length is 4.0m. It is subjected to factored axial compressive load of 1500kN and a factored moment of 90kNm about its major axis at both the ends. Check whether the column section is safe or not.</p>	25
4.	<p>a) An <b>ISMB 600 @122.6kg/m</b> has been used as a column of effective length 4.2m. Calculate the load carrying capacity (<math>P_d</math>) of the column. b) Design a suitable '<b>bolted / welded gusseted base plate</b>' 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 <math>A_{nb} = 353\text{mm}^2</math> for bolted connection and 'shop weld' for welded connection.</p>	25

Form A : Paper-setting Blank

.....**Bachelor of Civil Engineering (Civil Engineering) 4<sup>th</sup> Year...** EXAMINATION, 2019  
(1<sup>st</sup> / 2<sup>nd</sup> Semester / Repeat / Supplementary / Annual / Bi-Annual)

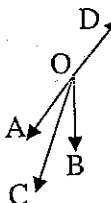
SUBJECT .....**Design of Structures -II**  
(Name in full)

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

Full Marks 100  
(50 marks for part II)

Time: ~~Two hours~~/~~Three hours~~/~~Four hours~~/~~Six hours~~

Use a separate Answer-Script for each part

No. of Questions	PART II				Marks
	<b>Assume reasonable data if not given, IS 800, IS875, Section Hand Book are allowed in the examination hall</b>				
	<b>Answer any two questions</b>				
1)					8
a)	A tie member of truss consisting an angle section ISA 60×60×6 of Fe410 grade is welded to 10mm gusset plate. Design a weld to transmit a factored load of 250kN. Assume shop weld.				
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 10mm.				17
	 <p style="text-align: center;">Fig. 1</p>				
	Member	OA(Rafter)	OD(Rafter)	OC(Inclined)	OB(Vertical)
	Force from DL and LL combination	195kN(C)	180kN(C)	46kN(T)	38kN(C)
	Section provided	2 nos 65×65×8	2 nos 65×65×8	1 nos 60×60×8	1 nos 60×60×8
2.a)	Design a bolted moment-shear bracketed connection to carry a factored vertical load of 280kN. The load is acting at a distance 450mm from the face of the column. The cross section of the column is <u>ISMB450@72.4kg/m</u> .				10
b)	A single angle (100×100×8) is connected to the gusset plate at the ends with 4 nos 16φ 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.				15

3. Calculate the nodal wind force on the truss shown in Fig. 2 and the wind pressure on the walls as per IS:875-2015, part-III of the factory shed with the following dimensions:

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- i) Location---Vishakapatnam
- ii) Span of truss ---20m
- iii) Spacing of truss---3.5m
- iv) Number of trusses---8
- v) Height of eaves from GL---12m

