MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL (A constituent unit of MAHE, Manipal)

FIFTH SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER MAKE UP EXAMINATION BASIC STRUCTURAL STEEL DESIGN (CIE 3152)

TIME: 3 HRS.

MAX. MARKS: 50

Note:

- Answer all questions.
- Any missing data may be suitably assumed.
- Use of IS 800:2007 code and SP 6 handbooks are permitted.
- Use Fe410 steel of yield strength fy 250 N/mm² unless specified otherwise.

Q.	QUESTION	MARKS	CO	BL
14	Calculate the shear force experienced by the bolts 1 and 2 as indicated in the figure. The bolts are of 16 mm diameter of 4.8 grade.	5	1	3
18	Determine the design shear strength (Vdb) of the bolts in the connection shown in figure. The bolts are of size M25 and grade 4.6.	5	1	3



3A	A battened column is made up of 2, ISMC 200@22.1 kg/m carries a factored axial compressive load of 600 kN. The size of the end battens is 300 mm \times 6 mm and intermediate batten is 250 mm \times 6 mm. If distance between centre-to-centre of battens longitudinally (C) is 1200 mm and transverse distance between the batten (S) is 170 mm, determine the adequacy of the battens in terms of shear strength and bending strength.	5	3	3
3B	An upper storey column ISHB 350 @ 67.4 kg/m carries a factored load of 1400kN and factored moment of 12 kN-m. This is to be spliced with lower storey column ISHB 450@ 87.2kg/m. Design a suitable bearing plate only. Connections need not be designed	3	4	3
3 C	Draw the sectional elevation of plate girder and name the components.	2	5	3
4 A	Determine the thickness of slab base plate for a column ISMB 200 @ 25.4kg/m carrying axial factored force 700kN. M25 concrete is used for foundation.	5	4	3
4B	A laterally supported beam has a Zez = 3060.4×10^3 mm ³ and Zpz = 3510.63×10^3 mm ³ . The given section is plastic and the plastic section modulus of shear area (Zpw) is 1080×10^3 mm ³ . If Vu = 600 kN and Vd = 944.75 kN Calculate the design bending strength.	5	4	3
5A	Determine the moment carrying capacity of a laterally unsupported beam ISMB150 @ 14.89 kg/m. The beam is simply supported over a span of 3.6 m length with ends fully restrained against torsion and both the flanges restrained against warping.	5	5	3
5B	A welded plate girder is simply supported over a span of 22 m and carries a factored superimposed load of 90 kN/m. Assume the compression flange is laterally restrained and prevented against rotation. Determine the size of plate girder (I section) without stiffeners and check the design capacity. Assume the beam is safe against deflection, web buckling and web crippling.	5	5	3