MANIPAL INSTITUTE OF TECHNOLOGY
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MANIPAL INSTITUTE OF TECHNOLOGY

FIFTH SEMESTER B.TECH. (CIVIL ENGINEERING)

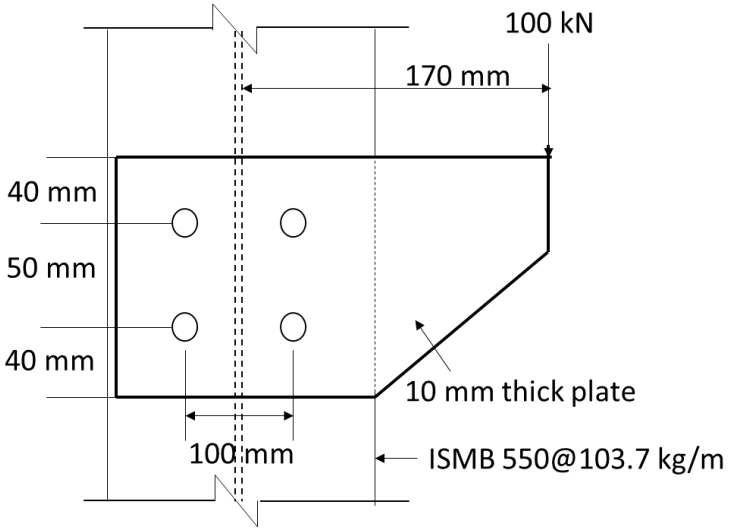
END SEMESTER EXAMINATION, NOV 2022

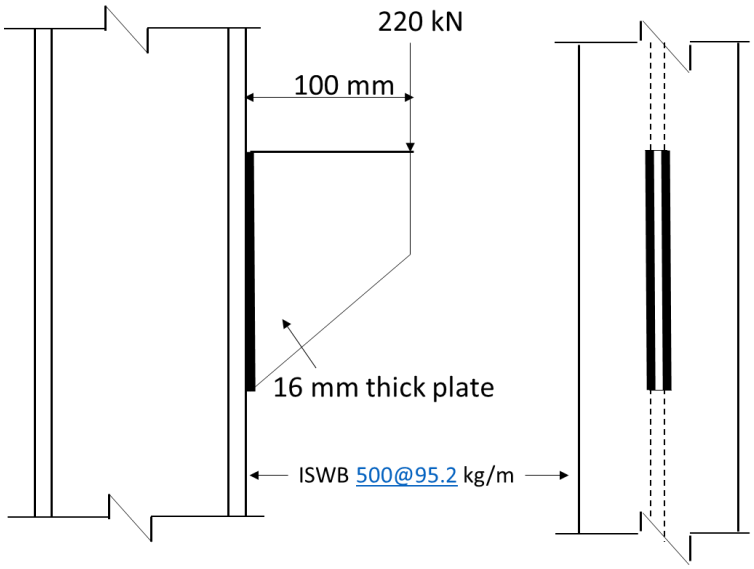
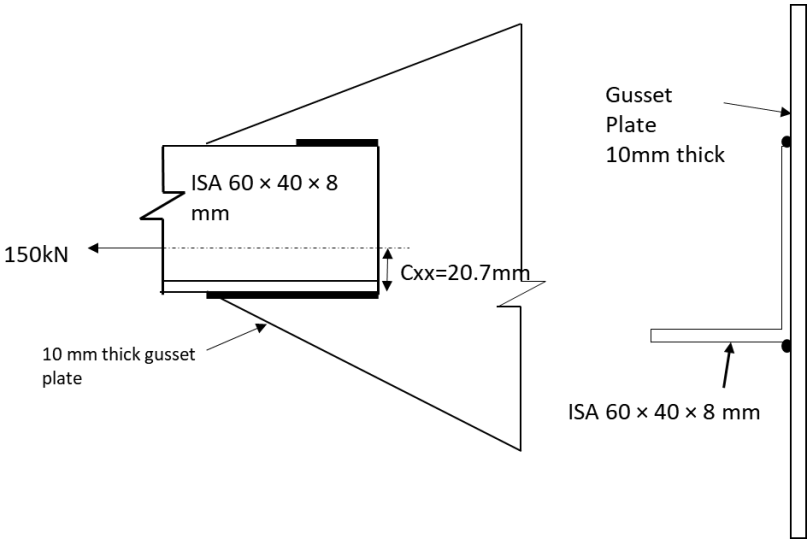
BASIC STRUCTURAL STEEL DESIGN (CIE 3152)

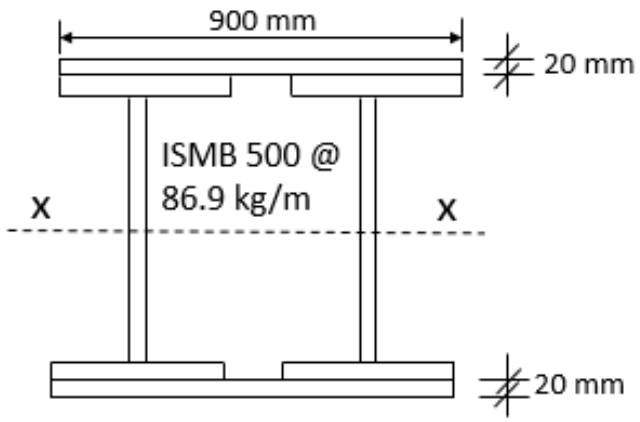
(26 –11 - 2022)

TIME: 3 HRS. **MAX. MARKS: 50**

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.
3. Use of IS 800:2007 code and SP 6 handbooks are permitted

Q. NO	QUESTION	MARKS	CO	BL
1A	Determine the maximum force in the bolt and check the adequacy of bracket connection shown in figure. The bolts are of 20 mm diameter with 4.8 grade. 	**5**	**1**	**3**
1B	Discuss the advantages of bolted connections over rivetted connections.	**3**	**1**	**2**
1C	Discuss the differences between laterally supported and laterally unsupported beams.	**2**	**5**	**2**
2A	Determine the length of a suitable fillet weld for the connection shown in figure. The bracket is subjected to a factored load of 220 kN. Assume shop weld of size 8 mm.	**5**	**2**	**3**

				
2B	Determine the length of welds required to join the longer leg of an ISA 60×40×8 to a gusset plate of 10 mm thick to carry an ultimate axial load of 150 kN through its centre of gravity. Assume 6 mm size field weld. 	**3**	**2**	**3**
2C	Illustrate with a neat sketch the various components of column splices when two columns of different sizes are joined.	**2**	**4**	**2**
3A	Calculate the load carrying capacity of a built up section showed in figure. The column is 3 m long with one end restrained against both rotation and translation, the other end is free in translation however restrained against rotation. Assume r_{min} of the built up section is corresponding to x-x axis.	**5**	**3**	**3**

				
3B	Determine size of column splice for a column ISHB 450 @ 87.2 kg/m to transmit a factored axial load of 2000 kN and a factored moment of 100 kN-m., If M32 bolts of design shear strength 100 kN are used for the connection between splice plate and column, determine the number of bolts required. The ends of the columns are milled/machine finished.	**5**	**4**	**3**
4A	Determine the size of suitable slab base for a column ISHB 400 @82.2 kg/m subjected to an axial factored load of 1000 kN. The column rests on a concrete block having grade concrete M25. Check the adequacy of connection, if the column and the slab base is connected with a weld of size 8 mm. The ends of the columns are not milled.	**5**	**4**	**3**
4B	An ISMB 450 beam is used to support a UDL of 40 kN/m at working load over a simply supported span of 7 m. If the beam is laterally restrained throughout its span calculate the adequacy of design for flexure and deflection only. The beam can be assumed to be safe against web crippling, web buckling and Shear.	**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 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 20 m and carries a factored superimposed load of 80 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**