Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. END SEMESTER EXAMINATIONS

JANUARY 2021

SUBJECT: BASIC STRUCTURAL STEEL DESIGN

[CIE 3152]

Date of Exam: Time of Exam: Max. Marks: **50**

Instructions to Candidates:

- Answer all the questions
- Any missing data may be suitably assumed
- Use of IS 800 and SP-6 handbooks in softcopies are permitted
- All plates are of grade E250 (Fe410) unless mentioned otherwise.

1A.	A bracket plate is connected to part of a machinery as shown in fig. Q1A. A UDL of W kN/m is acting on the bracket plate. Find the safe intensity of the load 'W' which the connection can carry. Bolts are M 20 and of grade 4.6.	**5**	**CO1**
1B.	Determine the length of the fillet weld required to carry a load as shown in Fig Q1B, assume shop welding with a weld size of 8 mm.	**5**	**CO1**
2A.	Determine the design tensile strength of a member consisting of angle ISA 150×115×10 mm of Fe 410 grade welded to a 12 mm gusset plate as shown in Fig Q2A. Assume shop welding with a weld size of 5 mm.	**5**	**CO2**
2B.	Calculate the design compressive load for a built-up section shown in Fig Q2B. The member is of 4 m effective length.	**5**	**CO3**
3A.	Details of a built-up column is as follows, Length of the column – 7.5 m End conditions of column - one end of the fixed but the other end is free against translation but restricted against rotation. Axial load to be carried by the column - 333.33 kN (service load) Main members – 2 numbers of ISLC 250@28 kg/m in back-to-back configuration Clear spacing between channel sections – 145 mm Cross sectional size of end batten – 200 mm × 3 mm Cross sectional size of intermediate batten - 180 mm × 3 mm Connection – M20 bolts in one line is used for the between main member and battens. Distance between centre-to-centre of battens – 1300 mm Check the design adequacy of the column and battens. Check against shear and bending is not necessary.	**5**	**CO3**
3B.	An upper storey column ISMB225@31.2 kg/m needs to be connected to a lower storey column ISMB300@44.2 kg/m to carry an axial service load of 850 kN and a service moment of 10 kN.m. For this purpose, following design is proposed, Size of bearing plate - 300 mm ×140 mm × 60 mm Thickness of flange plate – 8 mm If the ends of the columns are not milled check the adequacy of this design.	**5**	**CO3**

4A.	The design details of a gusseted slab base for a column ISHB 450@ 87.2 kg/m subjected to an axial factored load of 4250 kN is as follows, Grade of concrete used for pedestal – M30 Dimension of the base plate – 1000 mm × 400 mm × 50 mm If the gusset plate thickness is 25 mm and two ISA 200 mm × 200 mm ×12 mm are used to secure these gusset plates, check the adequacy of this design.	**5**	**CO4**
4B.	Design a simply supported beam of 9 m effective span which is laterally supported carrying a service load of 40 kN/m. The depth of the beam should not exceed 450 mm. Assume stiff end bearing 300 mm. check for web buckling and web crippling is not required.	**5**	**CO4**
5A.	Calculate the moment carrying capacity of a simply supported beam 3 m length. The beam is laterally unsupported and made up of ISMB400 @ 61.60 kg/m.	**3**	**CO5**
5B.	A welded plate girder simply supported over an effective span of 20 m is subjected to a factored maximum bending moment 4270 kN.m and factored shear force 900 kN. The compression flange of the girder is laterally restrained and prevented against rotation. Design the section of plate girder without stiffeners and check the moment carrying capacity of the section. Assume a stiff bearing of 300 mm. Also, design the welded connection between the flange and the web and draw a neat sketch. Checks for deflection, web buckling and web crippling are not required.	**7**	**CO5**

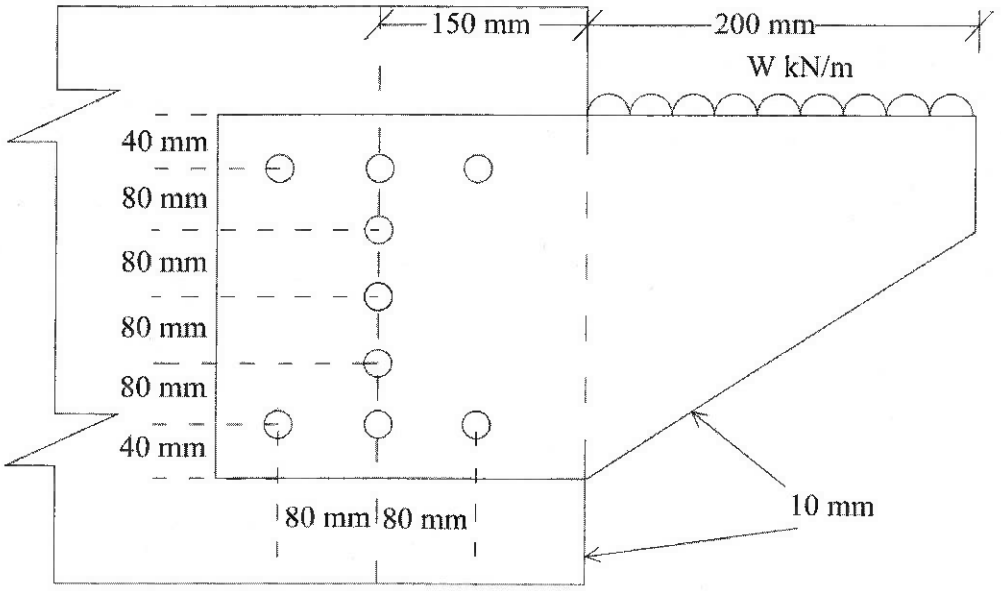

Fig. Q1A

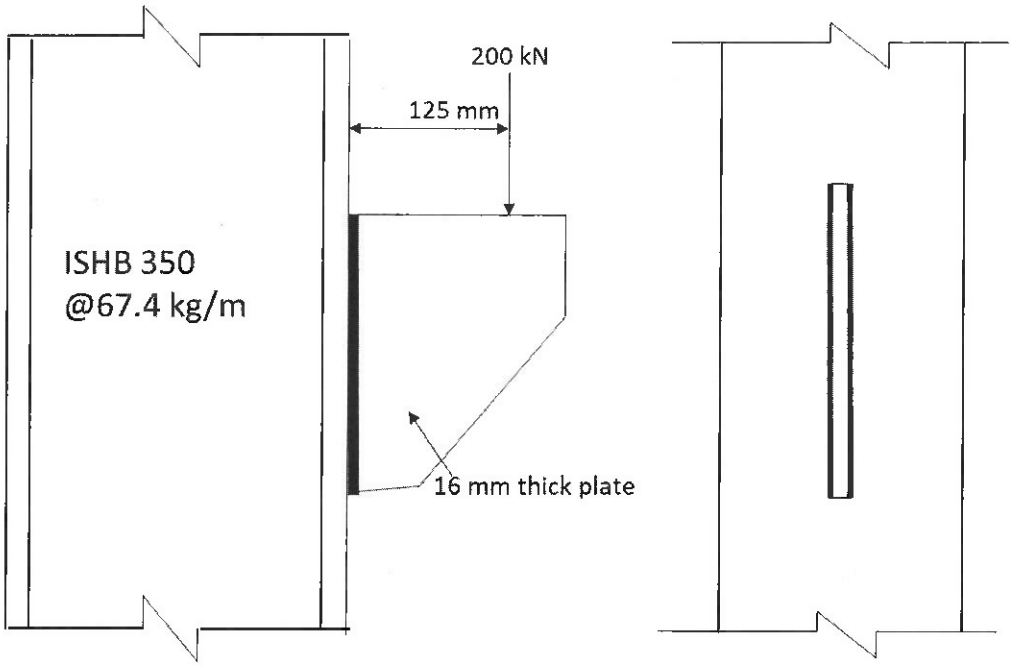

Fig.Q1B

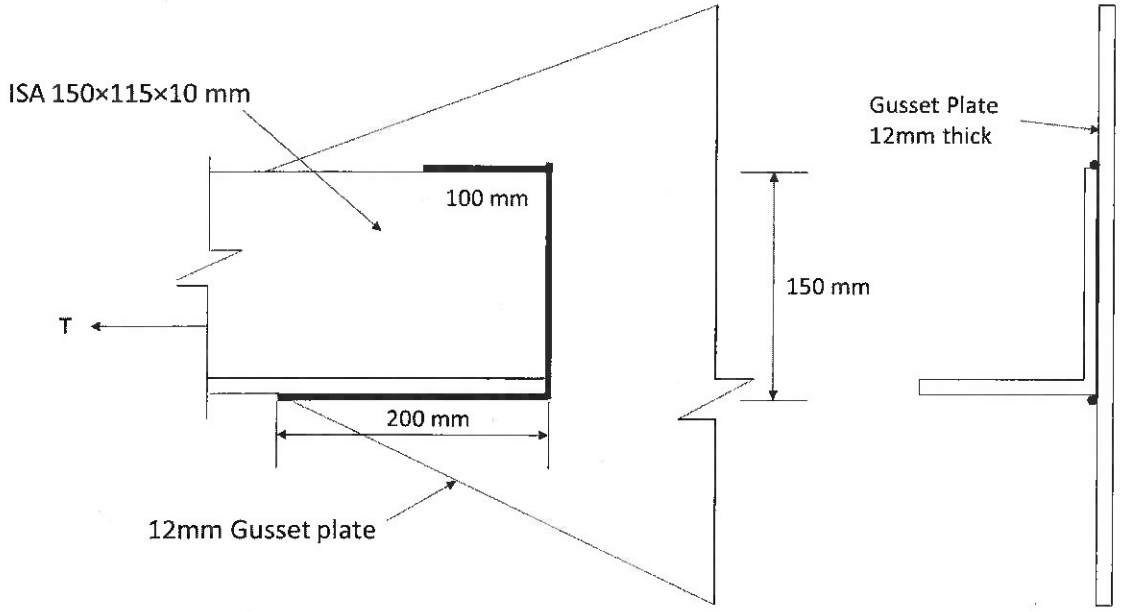

Fig.Q2A

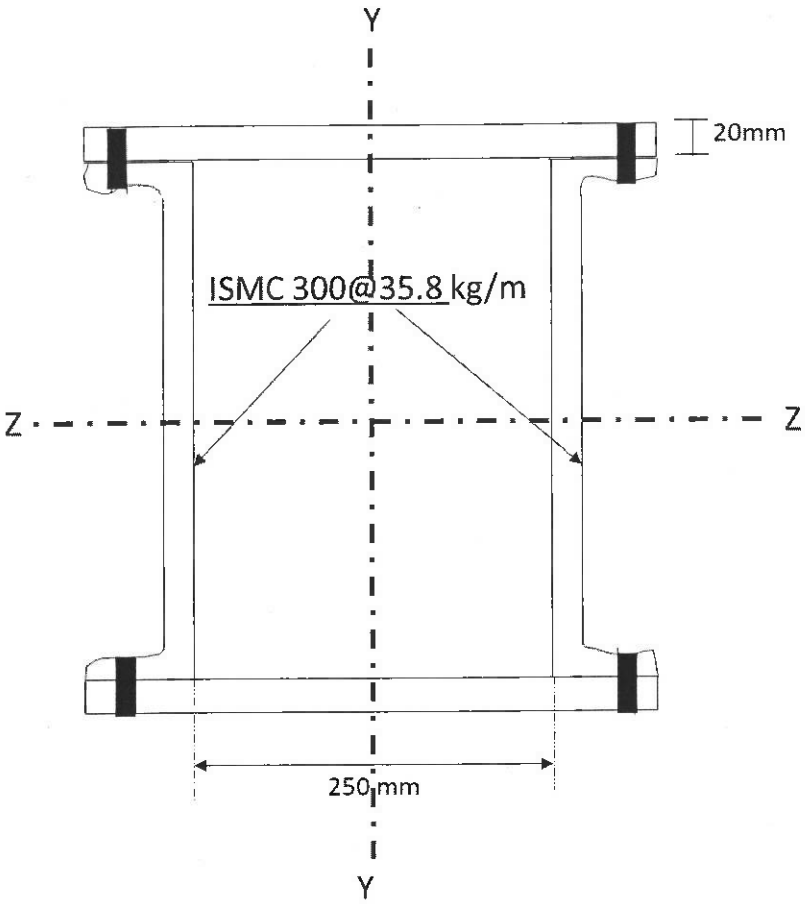

Fig.Q2B