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

V SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS
NOVEMBER 2018

SUBJECT: BASIC STRUCTURAL STEEL DESIGN [CIE 3102]
Date of Exam: **21/11/2018**   Time of Exam: Max. Marks: **50**

Instructions to Candidates:

❖ Answer **ALL** the questions. Use of IS800-2007 and SP-6 are Permitted
❖ Assume suitable data if missing. Answer all the questions. All plates are Fe410 (250) grade and bolts are grade 4.6 unless specified in the question

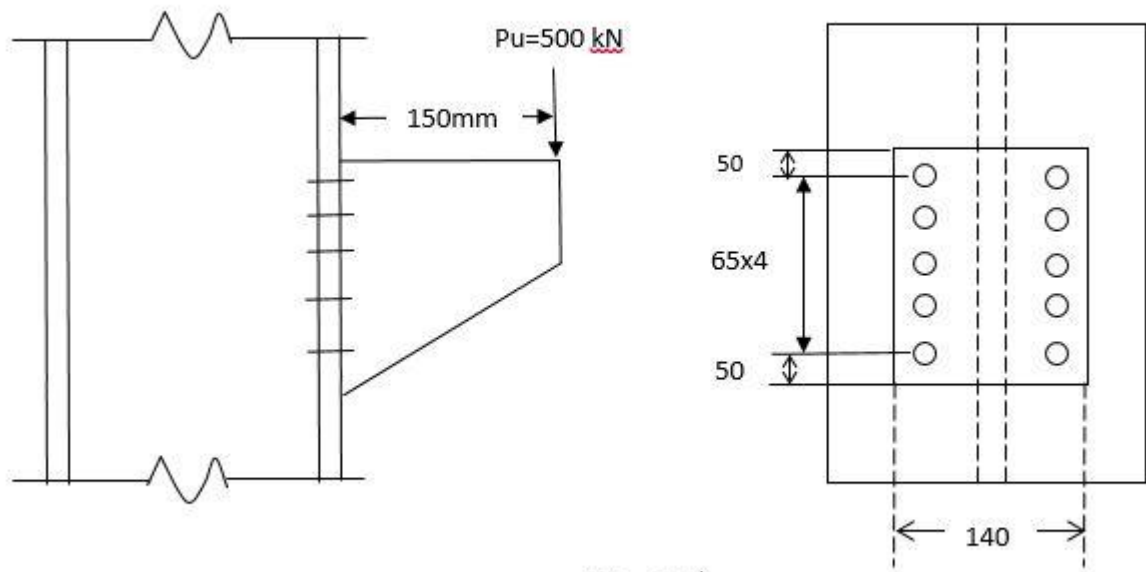|			
A.	For a bracket connection shown in Fig.Q1 check the design adequacy, if M25 bolts of grade 5.6 are used. The bracket plates are of thickness of 10 mm and is connected to flange of ISMB 450@72.4 kg/m.	**(06)**	**CO1**
1B.	Calculate the design strength of laterally supported beam made up of ISMB 450 @72.4 kg/m if, 0.6 Vd > Vu	**(04)**	**CO4**
2A.	Design an equal double angle tension member connected on each side of 12 mm gusset plate to carry a factored axial load of 450 kN. Use M20 bolts of grade 4.6 and assume shop fabrication.	**(06)**	**CO2**
2B.	Determine the bending strength of laterally unsupported plastic section ISMB 450@72.4kg/m used as a simply supported beam of span 6m.It is fully restrained against torsion and wrapping is not restrained in both flanges.	**(04)**	**CO5**
3A.	Design a single lacing system for a built-up column 9.5 m long to carry a factored load 950 kN. Column consists of 2 no's ISMC350 @ 42.1 kg/m placed back to back. The column is hinged at both ends. Connection of lacing with main member need not be designed.	**(06)**	**CO3**
3B	Determine the load carrying capacity of a built up column made of an ISMB 550 @ 103.7 kg with two plates of 200 mm × 16 mm attached to its flanges. Length of the column is 5.5 m and fixed at both the ends.	**(04)**	**CO3**
4.	Design a suitable column splice for a column ISLB 350 @ 49.5 kg/m to transfer a factored compressive load of 1000 kN, factored moment of 35 kN-m and a factored shear force of 30 kN. Using M20 bolts of grade 4.6, design the connection. Draw a neat sketch of the design details. Assume that the ends of the column are NOT milled.	**(10)**	**CO4**
5.	A welded plate girder is simply supported over a span of 24 m and carries a factored superimposed load of 45kN/m. Assume the compression flange is laterally restrained and prevented against rotation. Design the plate girder without stiffeners. Assume stiff bearing of 400 mm. Do the deflection check, web buckling and crippling check. Draw a neat Sketch of the final design.	**(10)**	**CO5**

Fig. Q 1