

# MANIPAL INSTITUTE OF TECHNOLOGY

V SEMESTER B.TECH. (CIVIL ENGINEERING)

## END SEMESTER EXAMINATIONS, NOV/DEC 2017

### SUBJECT: BASIC STRUCTURAL STEEL DESIGN [CIE 3102] REVISED CREDIT SYSTEM (17 /11/2017)

Time: 3 Hours

#### MAX. MARKS: 50

### Instructions to Candidates:

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

1A.	Explain briefly about special design consideration in steel design	3
1 <b>B</b> .	Check the design adequacy of bracket connection as shown in the Fig.QIB if the diameter of the bolt is M20 and plates are of thickness 14mm	7
2A.	Why the tension members are checked for stress reversal. Give the codal provision for different loading cases.	3
2B.	Design a double angle tension member connected on each side of 12mm gusset plate to resist a service dead load of 80kN and a service live load of 170kN use M25 bolts of grade 4.6 and assume shop fabrication. Consider pitch 65mm, edge and end distance of 45mm	7
3A.	Design a single lacing system for a built-up column 5.5 m long to carry a factored axial load 800 kN. Column consists of 2 no's ISMC250 @ 30.4 kg/m placed back to back. The column is fixed at both ends. Connection need not be designed.	6
3B.	A strut made up of a channel section of 4 m length with its web connected to gusset plates. If it has to support a service axial load of 600 kN design the strut by considering i) 2 bolts ii) welding. Assume $f_{cd} = 120 \text{ N/mm}^2$ for initial area calculation.	4
4A.	Design a suitable column splice for a column ISHB 250 @ 51 kg/m to transfer a compression factored load of 850 kN, factored moment of 20 kN-m and a factored shear force of 40 kN. Length of column is 4.5 m with both ends are hinged. Use M20 bolts design the connection. Draw a neat sketch of the design details. Assume that the column ends are milled.	7
4B.	Calculate the design bending strength of laterally supported beam made up of ISMB 600 @ 122.6 kg/m if, 0.6 $V_d$ > $V_u$	3
5A.	A welded plate girder is simply supported over a span of 30 m and carries a factored superimposed load of 37kN/m. Assume the compression flange is laterally restrained and prevented against rotation. Design the plate girder without stiffeners. Assume stiff bearing of 400mm. Draw a neat Sketch of the final design. Do the check for deflection. Check for web buckling and crippling is not required	6
5B.	Determine-the bending strength of laterally unsupported plastic section ISMB 400 used as a simply supported beam of span 5m.	4



Fig. Q1B