APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech S7 (S) Examination Sept 2020

Course Code: CE401
Course Name: - DESIGN OF STEEL STRUCTURES
(Use of Codes IS 800, IS 875, IS 883 . Assume suitable data wherever necessary)

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any two full questions, each carries 15 marks.   Marks

1 a) Sketch and briefly explain any three failure patterns of bolted connection.   (3)

   b) Design a tension member to carry an axial factored load of 500kN. Use a double   (12)
       angle rolled steel section connected (at site) to each side of a gusset plate of
       10mm thick using 20mm diameter bolts of grade 4.6.

2 a) What is shear lag? How it can be reduced?   (5)

   b) Determine the strength and efficiency of a bolted lap joint shown in figure. The   (10)
       bolts are of 20mm diameter, grade 4.6. The plates are of 12mm thick and grade
   Fe410.

All dimensions in mm
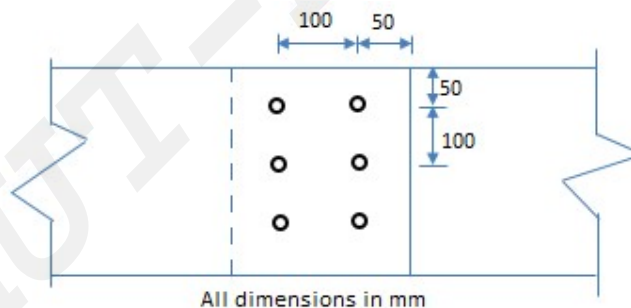
3 a) Differentiate between bearing type connection & friction type connection.   (5)

   b) A tie member consisting of an angle section ISA100x75x8, designed to transfer a   (10)
       factored axial load of 280kN, is to be welded to a gusset plate of 10mm thick,
       using 6mm fillet weld. Design the weld, if the weld is provided on three sides by
       overlapping the angle on the gusset plate, at a shop. Also sketch the connection
       showing the weld lengths.

PART B
Answer any two full questions, each carries 15 marks.

4 a) Explain the classification of cross sections as per the IS 800: 2007 based on yield and plastic moments & rotational capacities. (5)

b) Determine the design compressive load capacity of a column made of a rolled steel section ISMC200@217N/m if length of the column is 3m, with both ends fixed. (10)

5 a) Differentiate between web buckling & web crippling. (5)

b) An ISLB600@976.1N/m has been used as a simply supported beam over a span of 7.2m. Determine the safe uniform load that the beam can carry in flexure if the compression flange of the beam is restrained against lateral buckling. (10)

6 a) Design a built up column with two channels placed back-to-back and separated apart. The column is of 6m effective length and supports a factored load of 1500kN. Also design the bolted lacing system. (15)

PART C
Answer any two full questions, each carries 20 marks.

7 a) Explain various loads and load combinations to be considered in the design of a roof truss. (4)

b) Design an I section purlin for an industrial building, located at Chennai, with Galvanised iron sheets as the roofing material. (16)

Span of the truss =13m

Spacing of trusses = 6m c/c

Spacing of purlins = 1.2m c/c

Wind pressure intensity = 2 kN/m^2

Weight of GI sheets =130N/m^2

Grade of steel : Fe 410

8 a) Classify the timber based on grades, modulus of elasticity, durability, location and treatability. (5)

b) Design a bolted bracket connection (in plane) to support an end reaction of 500kN due to the factored loads supported by the beam, as shown in figure below. The eccentricity of the end reaction is 200 mm. The steel used is of grade Fe410 and bolts are of 20mm diameter, grade 4.6. The thickness of bracket plate may be taken as 10 mm. The column section is ISHB200 @366N/m. (15)
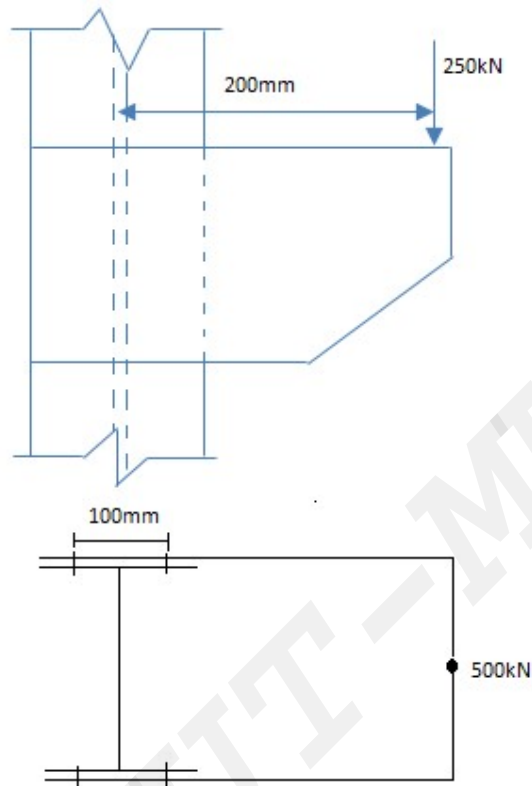
9 a) Write a note on grouping of timber based on modulus of elasticity & extreme   (4)
        fibre stress as per IS 883: 1994.

   b) Design a Teak wood beam to carry a uniformly distributed load of 15kN/m   (16)
        including self weight of the beam. The beam is simply supported over a clear
        span of 6m & the width of end bearings is 300mm.

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