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Pages: 2

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (S, FE) Examination May 2024/ S7 (PT) (S,FE) Examination June 2024 (2015 Scheme)



Course Code: CE401

Course Name: - DESIGN OF STEEL STRUCTURES

Max. Marks: 100

Duration: 3 Hours

(Use of IS800-2007, IS875-Part 3, SP 6 (1), IS883 are permitted)

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Sketch and briefly explain any three failure patterns of bolted connections. (3)
- b) Design a double cover butt joint between the two plates of width 300 mm, if the thickness of one plate is 18 mm and the other is 10 mm. The joint has to transfer a factored load of 480 kN. The plates are of Fe 410 grade. Use M20 bolts of grade 4.6. Cover plates are 8mm thick. (12)
- 2 a) Write three advantages and disadvantages of welded joints? (3)
- b) An ISLC 300 @ 324.7 N/m is used as a tie member to transmit a factored load of 800kN. The channel section is welded to a gusset plate of 12 mm thickness at site. Design a fillet weld if the lap length is limited to 350mm. Provide slot welds if required. (12)
- 3 a) Explain the purpose of lug angles in tension member design. (3)
- b) Design a truss diagonal subjected to a factored tensile load of 180 kN. The tension member is connected to a 20mm thick gusset plate with one line of M20 bolts of grade 4.6. (12)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) Design a column to support a factored load of 1200 kN. The length of the column is 4 m and both the ends are hinged. Use steel of grade Fe 410. (10)
- b) Write the detailed procedure for design of a bolted gusset base for a steel column. (5)
- 5 a) A hall of inside dimensions 6m x 12m is provided with a 100 mm thick RCC slab. Rolled steel joists are placed parallel to the 6m side to support the roof slab. The spacing of the beams are 3.0 m c/c. Design the steel I-beam if the width of the support is 150 mm. Live load = 2 kN/m<sup>2</sup>, floor finish = 1 kN/m<sup>2</sup>. (15)

- 6 a) An ISWB350@558.19 N/m has been used as a simply supported beam over a span of 6.5m. The beam has a cover plate of 200 mm width and 8 mm thickness on top and bottom flanges. Determine the safe uniform load that the beam can carry in flexure if the compression flange is restrained against lateral buckling. (10)
- b) Illustrate the different elements of a welded plate girder with sketches. (5)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) A roof truss shed is to be built in Patna(Bihar) for an industry. The size of shed is 50m x10m and the height of building is 5m at the eaves. The building is on open land on a fairly level topography. Determine the basic wind pressure. (5)
- b) A purlin is to be designed to support a GI sheet as roofing material for a truss spaced at 4 m c/c. Purlins along the principal rafters are arranged at a spacing of 2 m c/c. The slope of the principal rafter is 20 degrees. Design a channel section purlin assuming dead load on the purlin as  $0.05 \text{ kN/m}^2$ , live load as  $2 \text{ kN/m}^2$  and wind load as  $0.5 \text{ kN/m}^2$ . (15)
- 8 a) A bracket is bolted to the flange of the column ISHB 350@724N/m as shown in Fig.1 below. The bracket plate is 10 mm thick, eccentricity may be taken as 350 mm and the applied load is 300 kN. Design the connection using M20 bolts of grade 4.6. (14)

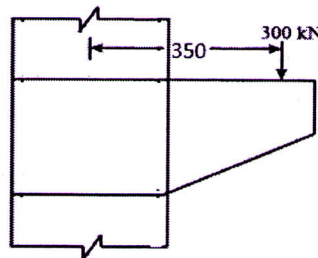


Fig. 1

- b) A deodar wood column of 4.1m unsupported length has a cross section of 250mm x300mm. Calculate the safe axial load carrying capacity of column. (6)
- 9 a) Discuss the various defects seen in timber. (5)
- b) Design a deodar timber beam of clear span 5 m to carry a udl of  $16 \text{ kN/m}$ , including self-weight. The beam is simply supported at both ends. (15)

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