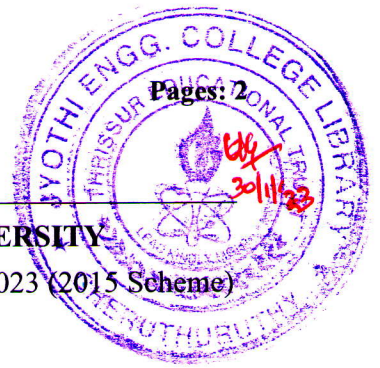


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Reg No.: \_\_\_\_\_

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Seventh Semester B.Tech Degree (S, FE) Examination January 2023 (2015 Scheme)

**Course Code: CE401**

**Course Name: - DESIGN OF STEEL STRUCTURES**

Max. Marks: 100

Duration: 3 Hours

**PART A**

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

Marks

- 1 a) Find the single and double shear value of a 20 mm bolt (Fe410, E250). (5)
- b) Design a lap joint between two plates of 100 mm width and 12 mm thick. The joint has to transfer a factored load of 120 kN. (10)
- 2 a) Explain the procedure to determine the tensile strength of an Indian Standard Angle Section carrying tension force connected to a gusset plate (5)
- b) A tie member of a roof truss consists of two ISA 90 x 60 x 10 mm. The angles are connected to either side of a gusset plate of thickness 10 mm; the member is subjected to a working tensile load of 250 kN. Design the welded connection if done in a workshop. (10)
- 3 a) Sketch and briefly explain the various failure patterns of bolted connection (5)
- b) A tension member of a roof truss has to carry a working load of 250 kN. Design the section and connection. (10)

**PART B**

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

- 4 Design a built-up column with channels placed back to back to carry a factored axial load of 1450 kN. The effective length of the column is 10 m. (15)
- 5 A hall of inside dimensions 6m x 14m 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 beam is 3.5 m c/c. Design the steel I-beam if the width of the support is 300 mm. Live load = 2 kN/m<sup>2</sup>, floor finish = 1 kN/m<sup>2</sup>. (15)
- 6 a) Design a simply supported beam of 8m effective span carrying a working load of 40 kN/m. The depth of the beam should not exceed 450 mm. (10)

- b) Differentiate between Gusset base and slab base and Discuss the design procedure of gusset plate (5)

**PART C**

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

- 7 a) Sketch five types of steel trusses commonly used by mentioning their spans (5)  
b) Find the wind pressure at Thiruvananthapuram for a temporary roof shed of size 30m x 40m with a height of 15 m in plain area. (5)  
c) Design an angle purlin spaced at 1.4 m c/c for a roof truss spaced at 3.5 m c/c. (10)  
The live load is  $0.6 \text{ kN/m}^2$ , and the weight of sheet and fixture is  $0.3 \text{ kN/m}^2$ , Take suction wind load  $1 \text{ kN/m}^2$ . The inclination of the rafter is  $18^\circ$ .
- 8 a) Write down five essential properties of timber. (5)  
b) Explain how timber is classified based on its growth and modulus of elasticity. (5)  
c) Design a timber beam of span 10 m to carry a udl of  $20 \text{ kN/m}$ , including self-weight. The allowable bending stress is  $10 \text{ N/mm}^2$ , and allowable shear stress is  $0.7 \text{ N/mm}^2$ . (10)
- 9 a) Design a timber column made of babul wood to carry a working axial load of  $100 \text{ kN}$ . The column has an effective length of  $3 \text{ m}$ . Allowable compressive stress =  $10 \text{ N/mm}^2$  and  $E = 10000 \text{ N/mm}^2$ . (5)  
b) Find the safe load on a column made of babul wood of  $200 \text{ mm} \times 200 \text{ mm}$  size with a height of  $2 \text{ m}$ . Allowable compressive stress =  $10 \text{ N/mm}^2$  and  $E = 10000 \text{ N/mm}^2$ . (5)  
c) A roof truss is to be built in Chennai for an industry. The size of the shed is  $12 \times 24 \text{ m}$ . The height of the building is  $8 \text{ m}$  at the eaves. Determine the basic wind pressure (5)  
d) Briefly explain various Guidelines to determine wind forces on different components of buildings as per IS code (5)

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