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^2, floor finish = 1 kN/m^2. (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. The live load is 0.6 kN/m^2, and the weight of sheet and fixture is 0.3 kN/m^2, Take suction wind load 1 kN/m^2. The inclination of the rafter is 18°. (10)

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 kN/m, including self-weight. The allowable bending stress is 10 N/mm^2, and allowable shear stress is 0.7 N/mm^2. (10)

9 a) Design a timber column made of babul wood to carry a working axial load of 100 kN. The column has an effective length of 3m. Allowable compressive stress = 10 N/mm^2 and E = 10000 N/mm^2. (5)

b) Find the safe load on a column made of babul wood of 200 mm x 200 mm size with a height of 2m. Allowable compressive stress = 10 N/mm^2 and E = 10000 N/mm^2. (5)

c) A roof truss is to be built in Chennai for an industry. The size of the shed is 12 x 24 m.The height of the building is 8 m at the eves. 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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