

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (R,S) (FT/WP/PT) Examination November 2025 (2019 Scheme)

Course Code: CET401**Course Name: DESIGN OF STEEL STRUCTURES****Use of IS 800 -2007, SP6(1), IS 875- part1, part2, part3 permitted****Assume any missing data suitably****Max. Marks: 100****Duration: 3 Hours****PART A***Answer all questions, each carries 3 marks.*

Marks

- | | | |
|----|---|-----|
| 1 | What are the advantages and disadvantages of welded joints? | (3) |
| 2 | Under what circumstances do we use slot welds and plug welds? | (3) |
| 3 | With the help of diagram, explain the concept of shear lag. | (3) |
| 4 | Elaborate on different modes of failure of tension members. | (3) |
| 5 | What is the main purpose of lacings and battens? | (3) |
| 6 | List out different types of column bases and their application. | (3) |
| 7 | Elaborate the importance of accounting for lateral torsional buckling in the design of steel beams. | (3) |
| 8 | Difference between laterally restrained and laterally unrestrained beam? | (3) |
| 9 | Explain how is fire resistance determined? | (3) |
| 10 | List out the various components of roof truss and write the purpose of principal rafter in a truss. | (3) |

PART B*Answer any one full question from each module, each carries 14 marks.***Module I**

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|----|--|------|
| 11 | Calculate strength of bolt connecting two 12 mm thick plates using M16 bolts of grade 4.6 using double cover butt joint with 8mm thick plates. | (14) |
|----|--|------|

OR

- | | | |
|----|--|------|
| 12 | An ISLC300 @324.7N/m (Fe410 grade of steel) is to carry a factored tensile load of 900kN. The channel section is to be site welded on three sides to the gusset plate 12mm thick. Design a fillet weld, if the overlap is limited to 350mm. Provide slot weld if required. | (14) |
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Module II

- 13 Design a single angle for a tension member of a roof truss to carry a factored tensile force of 230kN. The member is subjected to the possible reversal of stress due to the action of wind. The effective length of the member is 3m. Use 20mm shop bolts of grade 4.6 for the connection. (14)

OR

- 14 Design a tension member for a roof truss to carry a load of 210kN at working loads. Design the welded connection. Use double angle section. Use weld connection with a gusset plate of 10mm thickness. (14)

Module III

- 15 Design a built-up column 10m long to carry factored axial load of 1080kN. The column is restrained in position but not in direction at both the ends. Provide single lacing system with bolted connections. Assume steel of grade Fe 410 and bolts of grade 4.6. Design the column with two channels placed back-to-back. (14)

OR

- 16 A column ISHB 350 @661.2N/m carries an axial compressive factored load of 1700kN. Design a suitable bolted gusset base. The base rest on M15 grade concrete pedestal. Use 24mm diameter bolts of grade 4.6 for making connections. (14)

Module IV

- 17 The floor of a hall with internal dimensions 7m × 12m consists of 120mm thick RCC slab supported on steel I beams spaced at 4m c/c and 0.3m wide support. Beam carries a uniformly distributed load of 35kN/m (inclusive of self-weight). Design a beam, assume 410 grade of steel. (14)

OR

- 18 Design a laterally unsupported beam for the following data (14)
Effective span: 4m
Maximum bending moment: 550kN
Maximum shear force: 200kN
Grade of steel Fe410

Module V

- 19 Symmetric trusses of span 20m & height 5m are spaced at 4m c/c. Design the channel section purlin to be placed at suitable distances to resist the following loads (14)
Weight of sheeting including bolt = 180N/m²

Live load = 0.4kN/m^2

Wind load = 1.2kN/m^2

Spacing of purlin = 1.4m

OR

- 20 A bracket plate is welded to the flange of a column section ISHB 300 @ 618N/m (14) as shown in figure 1. Design the weld to support factored load of 120kN . Assume shop welding

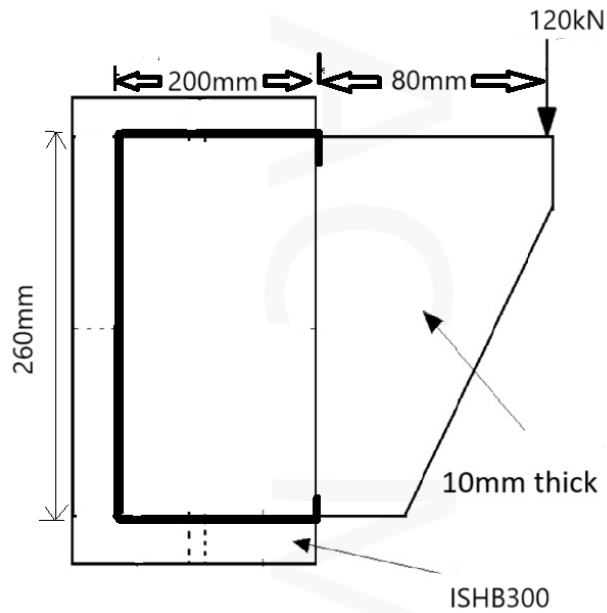


Figure 1
