

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (S,FE) (FT/WP/PT) Examinations May 2026 (2019 Scheme)

Course Code: CET401

Course Name: DESIGN OF STEEL STRUCTURES

Max. Marks: 100

Duration: 3 Hours

Use of IS-800:2007, IS-875 (3):2015, SP6, Steel Tables are permitted

State and assume suitable data wherever necessary.

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|----|---|-----|
| 1 | Discuss Lap Joint and Butt Joint with neat sketches and highlight their key differences. | (3) |
| 2 | Identify and explain any three commonly used steel sections in structural work. | (3) |
| 3 | Discuss how shear lag affects the stress distribution in tension members. | (3) |
| 4 | Describe the concept of block shear and how it governs the design strength of a tension member | (3) |
| 5 | What is lug angle and explain the purpose of providing a lug angle. | (3) |
| 6 | Outline the procedure involved in the design of a battened built-up column. | (3) |
| 7 | Explain how lateral stability of steel beams is ensured. Illustrate any three methods with neat sketches. | (3) |
| 8 | With a neat diagram, explain the different elements of a plate girder | (3) |
| 9 | Explain the significance of understanding steel behaviour at elevated temperatures for fire-resistant design. | (3) |
| 10 | Explain the process of computing wind pressure on roof trusses according to IS 875 (Part 3):2015. | (3) |

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

- | | | |
|----|---|------|
| 11 | Design a bolted double cover butt joint to connect two 16 mm thick Fe 410 plates carrying a working load of 400 kN. Use 8 mm thick cover plates and bolts of grade 4.6. | (14) |
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OR

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| 12 | Design the welded connection for a tie member made of 2 ISMC 225 sections placed on either side of a 12 mm thick gusset plate, so as to develop the full | (14) |
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strength of the tie. The overlap is restricted to 450 mm. Use slot welds wherever necessary.

Module II

- 13 Design a bridge truss diagonal subjected to a factored tensile load of 300 kN. The length of the diagonal is 3m. The tension member is connected to a gusset plate 16mm thick with one line of 20mm diameter bolt of grade 8.8 (14)

OR

- 14 Design a welded unequal angle tension member, connected to a 16 mm thick gusset plate to carry a working tensile load of 200 kN. Use Fe 410 steel. (14)

Module III

- 15 Design a built-up column of 10 m effective length to carry a factored axial load of 1100 kN. The column is restrained in position but not in direction at both ends and consists of two channels placed face to face with a single lacing system using bolted connections. Use Fe 410 steel. (14)

OR

- 16 a) Explain the purpose of column bases in steel structures. Describe any one type with neat sketch. (4)
b) Design a suitable welded base plate for an ISMB 300 column transmitting a working load of 800 kN to an M25 concrete pedestal. (10)

Module IV

- 17 Design a simply supported steel beam of 7m span to carry a total factored load of 54kN/m (inclusive of self-weight) and an imposed load (at midspan) of 150 kN. The compression flange is laterally supported by the floor system. Assume 75 mm end bearing. (14)

OR

- 18 Determine a suitable laterally unsupported steel beam section for a cantilever beam span of 5.0 m subjected to a factored load of 45kN/m. Assume Fe 410 steel. (14)

Module V

- 19 Design a purlin for a sloping roof truss having a slope of 1V:2H, subjected to a dead load of 400 N/m, live load of 560 N/m, and wind pressure of 1.14 kN/m². The purlins are spaced at 1.5 m c/c and span 8 m, simply supported on rafters. (14)

OR

- 20 a) Determine the design wind pressure on the roof of an industrial shed located near Allahabad with a basic wind speed of 47m/s. The shed is situated on flat terrain with few surrounding structures. The roof truss span is 16 m, rise is $\frac{1}{4}$ of span, and height of the column on which the truss is placed is 11 m. The purlin spans 8m and is placed at an interval of 2.235m. (8)
- b) Explain the various techniques adopted for fire safety in structures. (6)
