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)

OR

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)

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 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)

****