

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination December 2022 (2019 scheme)

Course Code: CET401**Course Name: DESIGN OF STEEL STRUCTURES****Max. Marks: 100****Duration: 3 Hours****Use of IS-800, IS-875, SP6, Steel Tables is permitted
State and Assume suitable data wherever necessary.****PART A***Answer all questions, each carries 3 marks.*

Marks

- | | | |
|----|--|-----|
| 1 | Differentiate between Lap joint and Butt joint. | (3) |
| 2 | List the various types of Structural steel sections available in the market. | (3) |
| 3 | Explain the failure modes of tension member. | (3) |
| 4 | What is lug angle? Explain the design criteria of lug angle. | (3) |
| 5 | What are the main purpose of lacings and battens? | (3) |
| 6 | Differentiate between Gusset base and slab base. | (3) |
| 7 | Explain web buckling and web crippling. | (3) |
| 8 | Sketch and explain different elements of a welded plate girder. | (3) |
| 9 | Sketch and explain different features of a roof truss. | (3) |
| 10 | Explain the material properties of steel at elevated temperatures. | (3) |

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

- 11 Design a double cover butt joint between the two plates, each of thickness 14 mm. The joint has to transfer a working load of 300 kN. Assume cover plate of thickness 8 mm. The plates are of Fe 410 grade. Use bolt of grade 4.6. (14)

OR

- 12 A tie member consists of 2 ISMC 250. The channels are connected on either side of a 12mm thick gusset plate. Design the welded joint to develop the full strength of the tie, however the overlap is limited to 400mm. Use slot weld if required. (14)

Module II

- 13 A bridge truss diagonal carries a pull of 200 kN. The length of the diagonal is 3m. Design a suitable section. The member is connected to a gusset plate of 14 mm thick. Use bolt of grade 4.6 and steel Fe 410. (14)

OR

- 14 Design a tie member to transfer a factored axial load of 300 kN, is to be welded to a gusset plate of 10mm thick. Design the weld if the weld is provided on two sides by overlapping the angle on the gusset plate at a shop. Also sketch the connection showing the weld lengths. (14)

Module III

- 15 Design a built-up column consisting of two channels placed back to back to carry an axial factored load of 800 kN. Length of the column is 7m and the column is restrained in position but not in direction at both ends. Provide batten system with bolted connection. Use steel of grade Fe 410. (14)

OR

- 16 A built-up column 10m long to carry a factored axial load of 1500 kN. The column is restrained in position and direction at both the ends. Provide single lacing system with bolted connection. Design the built up section as two channels placed back to back. Use steel of grade Fe 410. (14)

Module IV

- 17 A hall in a building is 15m x 18m is provided with a RCC slab over rolled steel beams spaced 6m centre to centre. Design the simply supported main beam supporting concrete floor slab if thickness of concrete slab is 150 mm and a wearing coat of 40 mm thick is provided over the slab. Weight of concrete slab and wearing coat is 24 kN/m^3 . (14)

OR

- 18 A beam simply supported over an effective span of 9 m. The beam spacing is 3m and beam carry a dead load of 5 kN/m^2 inclusive of its own weight. The imposed load on the beam is 15 kN/m^2 . The depth of the beam is restricted to 575 mm. Design the beam, assuming that the compression flange of the beam is laterally restrained by floor construction. (14)

Module V

- 19 Design a purlin on a sloping roof truss with the dead load of 0.15 kN/m^2 , a live (14)

load of 2.5 kN/m^2 and a wind load of 0.6 kN/m^2 (suction). The purlins are 1.9 m centre to centre and a span of 4 m, simply supported on a rafter at a slope of 20° .

OR

- 20 a) Determine the design wind pressure on a pitched roof near Delhi. (8)

Given Structure: An industrial shed situated on flat terrain with sparsely populated buildings. The span of roof truss is 20 m and rise is 4 m Height of building at eaves: 10 m

- b) Explain various methods of fire protection. (6)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree (S, FE) Examination May 2023 (2019 Scheme)

Course Code: CET401**Course Name: DESIGN OF STEEL STRUCTURES****Use of codes IS 800-2007, IS 875(Part-3)-2015, IS 883 are permitted. Assume any other data where ever necessary****Max. Marks: 100****Duration: 3 Hours****PART A***Answer all questions, each carries 3 marks.*

Marks

- | | | |
|----|---|-----|
| 1 | What are the mechanical properties of structural steel? | (3) |
| 2 | Explain failure of bolted joints. | (3) |
| 3 | What do you mean by prying forces? | (3) |
| 4 | What is a lug angle? | (3) |
| 5 | Explain the failure modes of axially loaded column. | (3) |
| 6 | Write design procedure of battened column | (3) |
| 7 | What is meant by lateral torsional buckling of beam? How it is taken care of in the design? | (3) |
| 8 | With suitable sketch explain any two types of stiffeners used in plate girder | (3) |
| 9 | Write different steps for finding wind load in roof truss | (3) |
| 10 | What is fire resistance? What are the domains in which fire resistance is specified? | (3) |

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

- 11 a) Two plates 10mm & 18mm thick are to be joined by double cover butt joint. (14)
Design the joint for a factored tensile load of 700 kN. Bolts used are of 24 mm diameter, grade 4.6 and the plates are of grade Fe 410. Cover plates on each side are of 8mm thick.

OR

- 12 a) A tie member consisting of ISA 80×50×8 mm is welded to 12 mm thick gusset (14)

plate. Design the fillet weld if the weld is to be done on two longitudinal sides so as to transmit load equal to design strength of the section.

Module II

- 13 Design a single angle tension member to carry factored load of 350 kN. Length of the member is 3.5 m. The tension member is connected to a gusset plate of 16 mm thickness with one line of 20 mm diameter bolts of grade 4.6 (14)

OR

- 14 A tie member consisting of an angle section ISA 100×75×8 designed to transfer a factored axial load of 300 kN is to be welded to a gusset plate of 10 mm thick using 6 mm fillet weld. Design the weld if the weld is provided on three sides by overlapping the angle on the gusset plate at a shop. Also sketch the connection showing the weld length. (14)

Module III

- 15 Design a built-up column of 9 m length to carry a factored axial load of 1100 kN. The column is restrained in position, but not in direction at both ends. Design the column with connecting system as lacings with bolted connection. Use two channels back-to-back, Fe 410 grade steel and bolts of grade 4.6 (14)

OR

- 16 a) Explain slab base and gusset base with diagram. (4)
b) A column ISHB 350@661.2 N/m carries a factored axial compressive load of 1700 kN. Design a suitable bolted gusset base. The base rests on M20 grade concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making connections. Assume Fe 410 grade of steel. (10)

Module IV

- 17 A hall 8m×16m is provided with a RCC slab over rolled steel beams spaced 4 m centre to centre and 0.3 m wide supports. Design the simply supported main beam supporting concrete floor slab if thickness of concrete slab is 120 mm and a wearing coat of 50 mm thick is provided over the slab. Weight of the concrete slab and wearing coat is 25 kN/m³. (14)

OR

- 18 Design a beam of 5.4 m span carrying a uniformly distributed load of 30 kN/m and two concentrated loads of 50 kN each at third points. The depth of the beam is restricted to 350 mm. Assume the compression flange to have lateral restraint. (14)

Module V

- 19 Design an I section purlin on a sloping roof truss with a dead load of 0.15 kN/m^2 (14) and a live load of 2 kN/m^2 . The purlins of span 4 m, simply supported on a rafter at a slope of 20° are situated at 2 m centre to centre distance. Assume basic wind speed as 39 m/s.

OR

- 20 a) Explain the variation of properties of steel with temperature. (8)
b) With a neat sketch, explain the analysis of bolted bracket Type II connection in detail, with the derivation of equations. (6)
