Code No: 156CY

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, January/February - 2025
STRUCTURAL ENGINEERING – II (STEEL)
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B. i) **Part-A** for 15 marks, ii) **Part-B** for 60 marks.

- Part – A is a compulsory question consisting of ten sub-questions. The first five sub-questions are from each unit relating to design theory and codal provisions and carry 2 marks each. The next five sub-questions are from each unit and carry 1 mark each.
- Part – B consists of 5 questions (numbered 2 to 11) carrying **12 marks each**. Each of these questions is from one unit and may contain sub-questions. For each question there is either or choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

PART – A

(15 Marks)

1.a)	Define prying action in bolted connections	[2]
b)	Differentiate between laced and battened columns with respect to their application and design.	[2]
c)	Discuss the significance of bending and shear strength in designing built-up sections.	[2]
d)	Explain the importance of economical depth in plate girder design	[2]
e)	List out the types of roof trusses commonly used.	[2]
f)	What is the significance of yield strength in structural steel?	[1]
g)	What is the buckling class of a compression member?	[1]
h)	What is the plastic moment in structural steel?	[1]
i)	What are the main elements of a welded plate girder?	[1]
j)	List out the assumptions involved in the design of purlins.	[1]

PART – B

(60 Marks)

2. Design a diamond pattern double cover butt joint to join two plates of size 250 × 12 mm each with 22 mm diameter bolts of grade 4.6. The plates are required to carry a factored tensile load of 520 kN. Use steel of grade Fe 410. [12]

OR

3. Two plates of thickness 18 mm and 10 mm are to be joined by a butt joint. The joint is required to transmit a factored load of 550 kN. Design the joint using 6 mm thick cover plates provided on both sides of the plates. Use steel of grade Fe 410 and 16 mm diameter bolts of grade 4.6. [12]

4. Design a simply supported steel beam of effective span 3 m carrying a concentrated load of 200 kN at mid-span. [12]

OR

5. Design a tension member 1.2 m long to resist a service dead load of 20 kN and a service live load of 60 kN. Propose a rectangular bar of steel grade Fe410, assuming the member is connected by one line of 18 mm diameter bolts of grade 4.6. [12]

6. Derive the equation for the plastic hinge length in a simply supported beam of length L subjected to a concentrated load W at the mid-span. [12]

OR

7. A beam has a maximum flexural moment of 300 kN-m and a maximum shear force of 210 kN. The span of the beam is 6 m. Using steel of grade Fe 410, design an appropriate section for the beam and perform checks for bending, shear, and web buckling. [12]

8. Design a welded plate girder with a span of 18 m, which is laterally restrained throughout. It carries a uniform load of 90 kN/m, excluding self-weight. Use steel of grade Fe410 and ensure no intermediate stiffeners are provided. [12]

OR

9. Explain the design considerations for welded plate girders under different loading conditions, including the design of web splices and flange splices. [12]

10. Design an I-section purlin for a roof truss with the following data:
Span of roof: 25 m
Height of truss: 6 m
Spacing of trusses: 5 m
Weight of sheeting including bolts: 200 N/m²
Live load: 0.7 kN/m²
Wind load: 1.4 kN/m², suction
Spacing of Purlins: 1.5 m. [12]

OR

11. A welded plate girder is made up of a 2500 mm × 12 mm web plate and flange plates of 500 mm × 50 mm. The girder has a span of 30 meters and carries a load of 50 kN/m, inclusive of self-weight, over the span. Design the intermediate stiffener and sketch the cross-section and longitudinal elevation of the plate girder. [12]

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