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**Question Paper Code : 40310**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Sixth Semester

Civil Engineering

CE8601 — DESIGN OF STEEL STRUCTURAL ELEMENTS

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Outline Structural Systems.
2. The yield strength for a mild steel specimen was found to be 250N/mm<sup>2</sup>. Taking a factor of safety of 2, determine the working stress.
3. What are the advantages of bolted connection over welded connection?
4. Recall effective length of weld.
5. Define shear lag.
6. In what situation, lug angles are used?
7. What are the parameters that affect the strength of compression members?
8. Classify columns.
9. Differentiate web buckling from web crippling.
10. List the loads to be considered in the design of a purlin?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the advantages and disadvantages of steel as a structural material. (8)  
 (ii) Explain the type of loads on structures and load combinations. (5)
- Or
- (b) (i) Compare working stress method and limit state design method for steel structures. (8)  
 (ii) Explain the mechanical properties of structural steel. (5)
12. (a) Determine the safe load P that can be carried by the joint shown in Fig.1. The bolts used are of 20mm diameter of grade 4.6. (13)

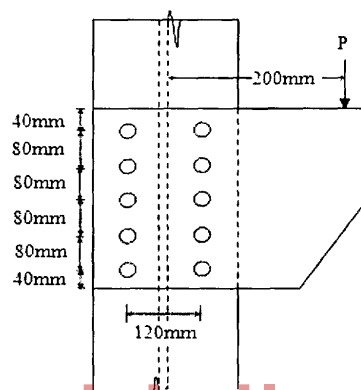


Fig.1

Or

- (b) Design a suitable fillet weld to connect the plates as shown in Fig. 2 to transmit a pull equal to the full strength of small plate. Given plates are 10 mm thick, grade of plate : Fe410 and welding is made in field. (13)

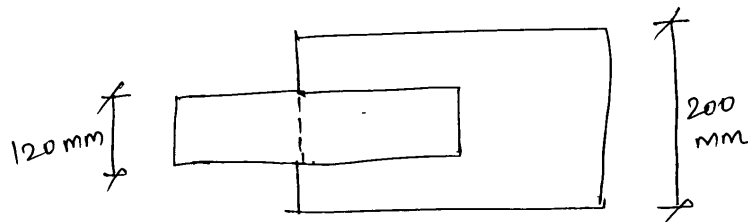


Fig.2

13. (a) Design a tension member to carry a load of 300kN. The two angles placed back to back with long leg outstanding are desirable. The length of the member is 2.9m. (13)
- Or
- (b) Design a tension splice to connect a 300mm × 20mm plate with a 300mm × 10mm plate. The design load is 500kN. Use 20mm diameter bolts. (13)

14. (a) Design a built-up column 9m long to carry a factored axial compressive load of 1100kN. the column is restrained in position but not in direction in both the ends. Design the column with connecting system as battens with bolted connections. Use two channel sections back-to-back. Use steel of grade Fe410. (13)

Or

- (b) Design a gusseted base to carry a factored axial load of 2800kN. The column consists of ISHB 450 @ 0.855kN/m with two cover plates 250mm × 20mm on either side. Take the effective height of column as 4m. (13)
15. (a) A simply supported beam joist of 4m effective span is laterally supported through out. It carries a uniformly distributed load of 40kN (inclusive of self weight). Design an appropriate section using steel of grade Fe410. (13)

Or

- (b) A beam is simply supported over a span of 6m. It supports one iron beam at 10 midspan exerting 90kN. Design a laterally unsupported beam with ISWB section with flange plates. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Two flats each 220mm × 10mm (Fe 410 Grade Steel), are to be joined using 20mm diameter, 4.6 grade bolts, to form a lap joint. The joint is supposed to transfer a factored load of 250kN. Design the joint. (15)

Or

- (b) Design an I-section purlin, for an industrial building situated in Coimbatore, to support a GI roof sheet for the following data: (15)
- Centre-to-centre spacing of truss = 5m  
Centre-to-centre spacing of purlins = 1m  
Span of truss = 10m  
Intensity of wind pressure = 2.1 kN/m<sup>2</sup>  
Weight of GI sheets 124N/m<sup>2</sup>  
Grade of steel= Fe410.