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Question Paper Code: U2603

M.E. DEGREE EXAMINATION, NOV 2024

Second Semester

Civil Engineering

21PSE203 - ADVANCED STEEL DESIGN

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 20 = 100 Marks)

1. (a) (i) Design a steel I section purlin from the following data steel with asbestos cement sheet covering. CO2- App (16)

Spacing of truss : 4 m
Spacing of purlins of principle rafters : 1.8 m
Inclination of principle rafter to the main tie : 30 degrees
Wind pressure of roof : 1 kN/m^2

(ii) Enumerate the principle of design of a purlin. CO1- U (04)

Or

(b) (i) A simple gable frame and determine the axial force and moment on the rafter and column for the following design data. CO2- App (16)

C/C building area : 16 x 32 m
Number of bays : 8
Width : 4 m
Span : 16 m
Rise : 3.2 m
Column height : 8 m
Gantry base : 6 m height
Design wind pressure : 0.92 kN/m^2
Spacing of purlin : 1.39 m

Use ISMC100 as purlin for the analysis. Also draw BMD due to DL + LL + WL.

(ii) What are the types of column bases provided for steel structures? CO1- U (04)

2. (a) Design welded seat angle connection between a beam ISMB 300 and a column ISHB 200 for a factored end reaction of beam 100 kN, assuming Fe410 grade of steel (f_y = 250 Mpa) and site welding. CO3- App (20)

Or

(b) An ISLB300 carrying udl of 50kN/m has effective span 8m. This is to be connected to the web of girder ISMB450. Design the framed connection using 20mm black bolts. CO4- Ana (20)

3. (a) The following data refers to a gantry girder on which an electrical operated crane of capacity 200kN moves, the Span of gantry girder: 6.0m; Span of crane girder: 18m; Crane capacity: 200 kN; Self weight of crane girder including trolley: 255 kN; Minimum hook approach: 1.0m; Distance between wheels: 3.5m; Self weight of rails: 0.25 kN/m. CO4- Ana (20)

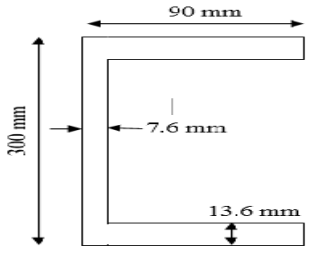
Determine

1. The maximum moment and shear force due to vertical and horizontal loads
2. Check whether ISMB600 with ISMC300 on compression flange is adequate to carry moment and shear force and buckling resistance and limiting deflections.

Or

(b) An industrial building is proposed to be built in Bangalore city where the basic wind pressure is 33m/s. Particulars of the building are: Length: 120m; Width: 24m; Roof truss: Fink; Eaves height: 8m above GL; Truss span: 24m Rise: 5m; Truss spacing: 5m; Purlin Spacing: 1.3m; Ground: Plain Land: Roof sheeting: ACC sheets. Design the purlin using channel section. CO4- Ana (20)

4. (a) Estimate the plastic section moduli about z-z and y-y axes and plastic moment capacity of the channel section shown in Fig. Assume f_y = 250MPa. CO5- Ana (20)



Or

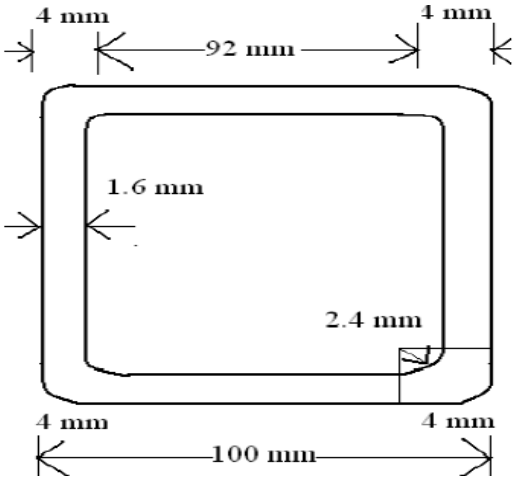
(b) A roof truss shed is to be built in Chennai for an industry. The size of shed is 30m x 50m. The height of building is 10m at the eves. Determine the basic wind pressure. CO5- Ana (20)

5. (a) Find the shape factor of the I section having the following dimensions: CO3- App (20)

Top flange : 150 mm X 10 mm
Web : 10 mm X 280 mm
Bottom flange: 300mm X 10 mm

Or

(b) Calculate the column section properties and allowable load for the column section shown in fig below. The effective length of the column is 3.2 m. Take fy = 235 N/mm2. CO5- Ana (20)



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