Reg. No. :

Question Paper Code: U2603

M.E. DEGREE EXAMINATION, NOV 2025

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   CO2- App   (16)
         asbestos cement sheet covering.

    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   CO2- App   (16)
         on the rafter and column for the following design data.

    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   CO1- U   (04)
    structures?

2. (a) Design welded seat angle connection between a beam ISMB 300   CO3- App   (20)
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.

Or

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

3. (a) The following data refers to a gantry girder on which an electrical   CO4- Ana   (20)
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.

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   CO4- Ana   (20)
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.

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

Or

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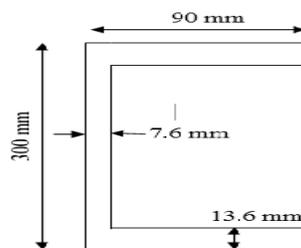
(b) A roof truss shed is to be built in Chennai for an industry. The size of shed is 30m x 50m. The height of building is 10m at the eves. Determine the basic wind pressure. CO5- Ana (20)

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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