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Question Paper Code: U2603

M.E. DEGREE EXAMINATION, APRIL / MAY 2025

Second Semester

Civil Engineering

21PSE203–ADVANCED STEEL DESIGN

(Regulations 2021)

Code Book Used: IS 800:2007, IS: 875 (Part I to V), IS: 801-1975, IS: 811-1987, IS: 6533-1989 (Part I & II), IS: 802-1977 & SP: 6 – Handbook on Structural Steel Section

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 20 = 100 Marks)

1. (a) (i) Design a slab base for a column ISHB300@577 N/m carrying an axial factored load of 1200 kN. The M20 concrete is used for the foundation provide welded connection between column and base plate. CO1- App (16)
(ii) Find the deflection of the purlin using the following data's. CO1- App (4)
 $w = 1.306 \text{ kN/m}$, $I_z = 416.4 \times 10^4 \text{ mm}^4$, $L = 4500 \text{ m}$ & $E = 2 \times 10^5 \text{ N/mm}^2$

Or
- (b) (i) Design a gusseted base for a column ISHB 350 @ 710 N/m with two plates 450 mm x 20 mm carrying a factored load of 3600 kN. The column is to be supported on concrete pedestal to be built with M20 concrete. CO1- App (16)
(ii) Determine the sectional properties for the given purlin section.(ISMB450) CO1- App (4)
2. (a) 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)

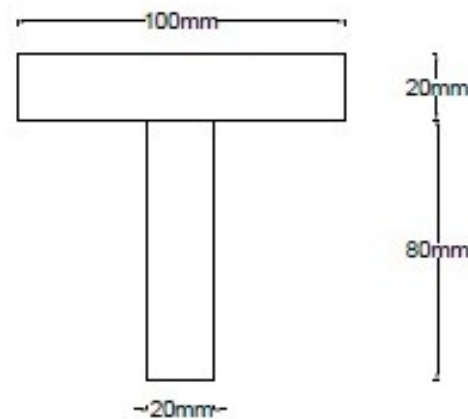
Or
- (b) Design the Unstiffened seat connection at the ends of a beam ISMB 500@0.896 kN/m transmitting a factored end reaction 130kN to a column ISHB250@0.510kN/m. Use 20 mm diameter bolts of 4.6 grade, take Fe410 ($f_y = 250 \text{ N/mm}^2$) grade of steel. CO4- Ana (20)

3. (a) A power plant structure having maximum dimension more than 60m is proposed to be built on downhill side near Dehradun. The height of the hill is 400m with a slope of 1 in 3. If the location is 250m from the crest of the hill on downward slope, and its eve board is at a height of 9m, Estimate the design wind pressure. CO4- Ana (20)

Or

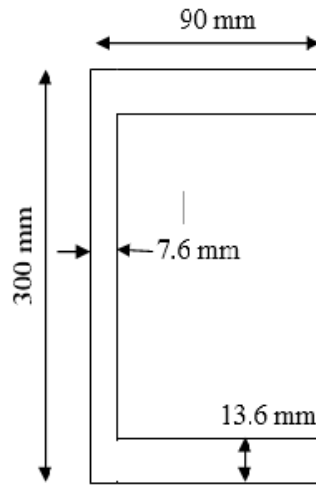
- (b) The following data refers to a gantry girder on which an electrical operated crane of capacity 200kN moves, the Span of gantry girder: 6.0m; Span of crane girder: 18m; Crane capacity: 200 kN; Self weight of crane girder including trolley: 255 kN; Minimum hook approach: 1.0m; Distance between wheels: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

4. (a) Determine the elastic section modulus S , plastic section modulus Z , yield moment M_y , and the plastic moment M_p of the cross-section shown below. What is the design moment for the beam cross-section? Assume Fe500 steel. CO3- App (20)

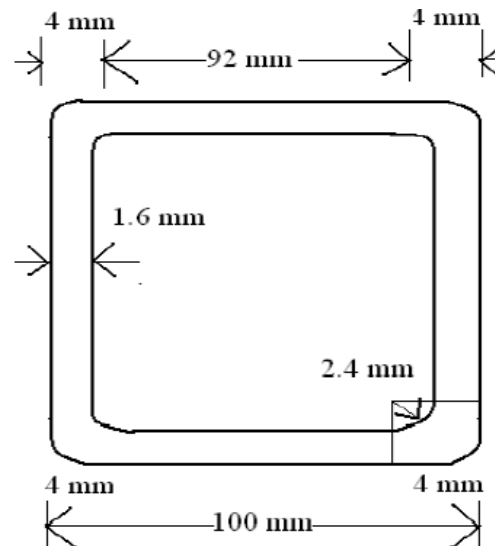


Or

- (b) Determine the plastic section moduli about z-z and y-y axes and plastic moment capacity of the channel section shown in Fig. Assume $f_y = 250\text{MPa}$. CO3- App (20)



5. (a) Analyse the sectional properties and allowable load for the column CO5- Ana (20) section shown in figure. The effective length of the column is 3.2 m. Take $f_y = 235 \text{ N/mm}^2$.



Or

- (b) Estimate the allowable load on the light gauge steel beam as shown in CO5- Ana (20) figure.

