

Roll No.

23393

**M.Tech Ist Sem. Civil Engg.
(Specialization in Structural Design)**

Examination-May, 2015

Design of Structures-I

Paper-MTSD-104

Time : 3 hours

Max. Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

Note : Attempt any five questions.

1. (a) Explain & draw stress-strain curve of mild steel in detail & also explain the design specification as per IS 800:2007.

[10]

(b) Explain the difference between welded & bolted connections. Which type of connections are preferred at site and why? [10]

2. (a) Design a column of effective length 6mm. It is subjected to an axial load of 1400kN provide two channels back to back connected with battens by welded connection. Assuming $f_y=250\text{MPa}$. [10]

(b) Design a beam of 6m effective span carrying a uniform load of 35kN/m if the compression flange is laterally unsupported. Assuming $f_y=250\text{N/mm}^2$.

[10]

3. (a) Design a tubular purlin section for the following data : [10]

Spacing of the roof truss c/c 5m

Dead load of roofing 0.5 kN/m

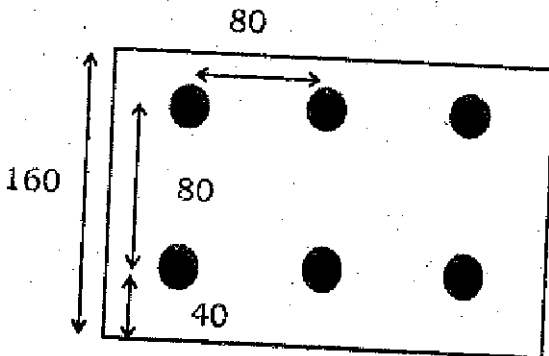
Live load on purlin 1.1 kN/m

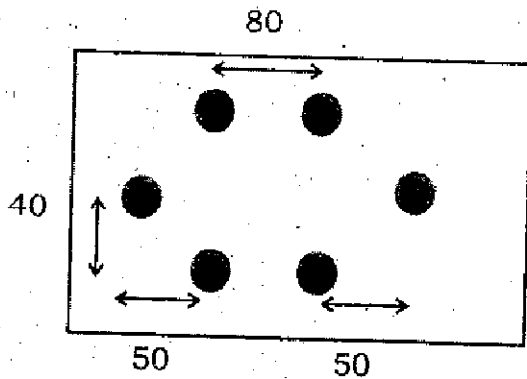
Wind load on purlin -1.5 kN/m

(b) A mild steel plate of size 160mm \times 12mm is used as a tension member in a roof truss. It is connected at its ends, to a gusset plate using 20mm rivet by : [10]

(i) Chain riveting

(ii) Zigzag riveting as shown below:





Calculate the maximum tension which the plate can carry in each case. Which arrangement is stronger ?

4. Design a roof truss of following data : [20]

Location = Delhi

Life span = 50 years

Permeability = Normal

Spacing = 3.5 m

Span of Truss = 15 m

Central rise = 3 m

Height of truss at eaves level — 10 m

$F_y = 250 \text{ Mpa}$

Corrugated GI sheet (self wt. 131 N/m^2)

Spacing of purlin limited to 1.4 m

5. Explain the following in detail : [20]

(a) Shear bond.

(b) Anchorage length.

(c) Development length.

(d) Behaviour of members subjected to flexural & axial loads.

(e) Stress-strain relationship for concrete and steel.

6. (a) Explain all types of footings with neat and clear sketch and also write down IS code recommendations for design of footing. [10]

(b) Design a rectangular isolated footing of uniform thickness, for R.C column bearing a vertical load of 600kN and having a base size of 400 × 600mm. The safe bearing capacity of the soil may be taken as 120kN/m². Use M20 concrete & Fe 415 steel. [10]

7. Design a R.C. slab for a room measuring 4m × 5m from inside. The slab carries a live load of 2000N/m² & is finished with 20 mm thick granolithic topping. Use M 20 concrete & Fe 415 steel. The slab is simply supported at all the four edges, with corners free to lift. [20]

8. (a) A circular column 4.6 m height is effectively held in position at both ends and restrained against rotation at one end. Design the column, to carry an axial load of 1200kN, if its dia is restricted to 450 mm. Use M 20 mix & Fe 415 steel. [10]

(b) What do you understand by balance section? [10]

A rectangular beam 300 mm wide & 400 mm deep is reinforced with 2 no. 12 mm dia. bars at top & 2 Nos. 16 mm dia. at bottom, each provided at an effective cover of 40 mm. Assuming concrete of M 20 grade & steel of Fe 415 grade, determine the resistance of the beam in pure torsion.
