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B. Arch
PCAR 8306

Sixth Semester Examination – 2008

STEEL STRUCTURE

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory
and any **five** from the rest.

The figures in the right-hand margin
indicate marks.

Indian Standard Codes and Tables are allowed.

**Books of References, Notes including class
notes are not allowed.**

1. Answer the following questions : 2 × 10
- (a) What will be the gross diameter of a rivet
having nominal diameter 25 mm ?



- (b) A single ISMC 175 @ 187.4 N/m is to be used as a compression member. If the effective length is 5 m, find the allowable compressive stress using 300 MPa grade of steel.
- (c) Sketch arrangement of rivets in diamond riveting.
- (d) A building of height 20 m is located in Bhubaneswar. Find the intensity of pressure.
- (e) Differentiate side fillet weld and diagonal fillet weld.
- (f) Explain web crippling.
- (g) State Unwin's formula.
- (h) An ISHB 300 @ 576.8 N/m is to be used as a beam. If effective length of beam is 6 m, find maximum permissible bending stress. Consider $f_y = 250$ MPa.

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Contd.

(i) Determine the strength of weld, if the size of the weld is 6 mm, effective length of fillet weld is 600 mm and allowable stress in weld is 110 N/mm^2 .

(j) 20 mm power driven rivets are to be used as field rivets. Find the permissible stress in rivets in shear and bearing.

2. Determine the strength of a double cover butt joint used to connect two flats 200 ISF 12. The thickness of each cover plate is 8 mm. Flats have been joined by 9 rivets in chain riveting at a pitch of 60 mm. What is the efficiency of the joint ? Adopt working stresses in rivets and flats as per IS 800 :1984. 10

3. (a) A column effectively held in position but not in direction at either end is 2.5 m long

and carries an axial load of 800 kN. Design the column if only steel beam sections are available. Use Fe 250. 5

(b) In a roof truss, a diagonal consists of an ISA 100 mm \times 100 mm \times 10 mm and it is connected to gusset plate by one leg only by 18 mm diameter rivets in one chain line along the length of the member. Determine tensile strength of the member using Fe 260 grade of steel. 5

4. A class room is 6 m \times 12 m. It is provided with 120 mm thick stone patties over rolled steel beams spaced 3 m centre to centre. A wearing coat of 20 mm thick cement concrete is provided over 160 mm thick lime concrete. The compression flange would be supported

throughout its length by providing a groove in patties. Design an intermediate rolled steel beam for following data :

Live load = 3 kN/m² Use Fe 250

Unit weight of stone patties and plain cement concrete = 24 kN/m³

Unit weight of lime concrete = 18 kN/m³

300 mm wide bed blocks will be provided to support the beam. 10

5. A column ISHB 400 @ 759.3 N/m with one cover plate 400 mm × 20 mm on either side is carrying an axial load of 3200 kN inclusive of self weight of base and column. Design a gusseted base. The allowable bearing pressure in concrete is 4 N/mm². The allowable bending stress in base plate is 185 N/mm². 10

6. A plate girder simply supported at ends is composed of web plate 1000 mm depth × 12 mm

thickness, and two flange angles ISA 200 mm × 100 mm × 15 mm, and two flange plates 500 mm × 20 mm thickness in each flange. The effective span of the plate girder is 10 m. The diameter of rivets used for connecting flange plates to flange angles and flange angle to web plate is 22 mm. Determine the maximum uniformly distributed load inclusive of self weight which can be carried by the plate girder. Assume maximum allowable stress as per IS 800 : 1984. Grade of steel = Fe 250. 10

7. A tie member of a roof truss consists of a 2 ISA 150 mm × 115 mm × 10 mm. The tie member is subjected to pull of 400 kN. The angles are connected either side of a gusset plate of 10 mm thick. Design the welded connection. 10

8. (a) Draw a neat sketch of end support of a roof truss showing various elements and their connections. 6
- (b) Describe different failure modes of a riveted joint. 4
