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**Question Paper Code: 42262**

M.E. DEGREE EXAMINATION, NOVEMBER 2015

Second Semester

Structural Engineering

14PSE202 - STEEL STRUCTURES

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

(Use of IS 800-2007, IS 875 and SP 6 is permitted, and assume missing data suitably)

PART A - (5 x 1 = 5 Marks)

- When two plates are placed end to end and are joined by cover plates, the joint is known as
  - Lap joint
  - Butt joint
  - Riveted joint
  - Double cover butt joint
- The number of bolts required in a lap joint is equal to
  - Load/Shear strength of the bolt
  - Load/Bearing strength of the bolt
  - Load/Bolt value
  - Load/Tensile strength of the plate
- When the welding between metals is done in a plastic stage by applying some external pressure, then that type of welding is known as
  - Fusion welding
  - Thermit welding
  - Pressure welding
  - Core welding
- The arrangement of members in a truss is made in such a way so that they should form
  - Rectangles
  - Quadrilaterals
  - Triangles
  - Parallelogram
- The ratio  $h/t$  of the webs of cold formed flexural members with unstiffened webs shall not exceed
  - 120
  - 150
  - 200
  - 230

PART - B (5 x 3 = 15 Marks)

6. What are the disadvantages of bolted connection?
7. List the different types of heavy moment resisting connections.
8. What are sway and non sway frames?
9. What is meant by redistribution of moment?
10. Write the expression for evaluating the critical buckling stress,  $\sigma_{cr}$  of the simply supported thin rectangular plate.

PART - C (5 x 16 = 80 Marks)

11. (a) Design an steel I section purlin from the following data steel with asbestos cement sheet covering.

Spacing of truss	: 4m	
Spacing of purlins of principal rafters	: 1.8m	
Inclination of principal rafter to the main tie	: 30 Degrees	
Wind pressure of roof	: 1 kN/sq.m	(16)

Or

- (b) A column consisting of ISHB 350 @ 67.4 kg/m carries an axial load of 350kN and a bending moment of 100 kNm in the plane of web. Design the attached base for the column with the provision of anchor bolts to resist the bending moment. Take permissible bearing pressure on footing as 5 N/mm<sup>2</sup>. Also design the welded connection for transfer of column forces to the base. (16)
12. (a) A beam ISLB 500 @ 75 kg/m transmits an end reaction of 190 kN and a end moment of 35 kN-m to the flange of ISHB 350 @ 67.4 kg/m. Design a Split beam moment resisting connection. Use M20 bolts of grade 4.6. Take Fe 410 grade steel ( $f_y = 250$  MPa). (16)

Or

- (b) An ISLB 300 @ 377 N/m transmits an end reaction of 50 kN to the flange of a column ISHB 200 @ 400 N/m. The fillet welds are applied directly on the sides of web of the beam. Design the connections. (16)
13. (a) Explain in detail about the step by step procedure of analysis and design of different types of north light roof truss. (16)

Or

- (b) Determine the loads acting on the column & roof of the industrial building for the wind blowing along ( $\theta = 0^\circ$ ) and across ( $\theta = 90^\circ$ ) the building. Consider internal pressure & suction corresponding to 5-20% opening in the building.

The building description is listed below,

Life of the structure	=	50 Years	
Class & Terrain Category	=	B & 2	
Topography	=	slope < 3 degree	
Size of the building	=	20m x 60m	
Clear Eave height	=	5m	
Bay spacing	=	6m	
Roof Slope	=	5 Degree	
Building Location	=	Chennai	(16)

14. (a) Find the collapse load for the given frame figure.1 (16)

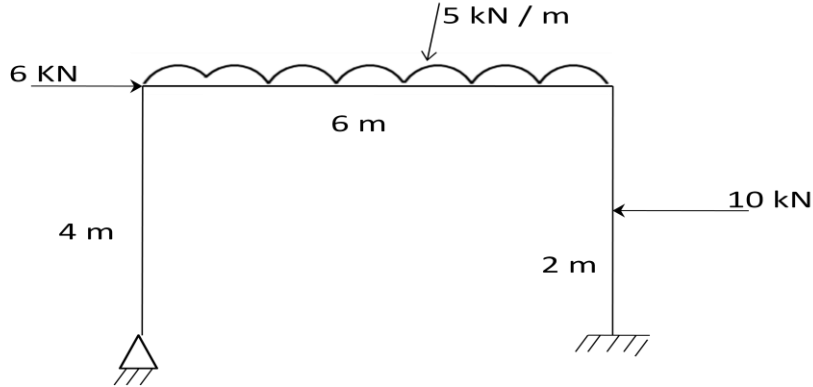


Figure 1

Or

- (b) Design the continuous beam with the ultimate load as shown in figure. 2 Provide uniform cross section. (16)

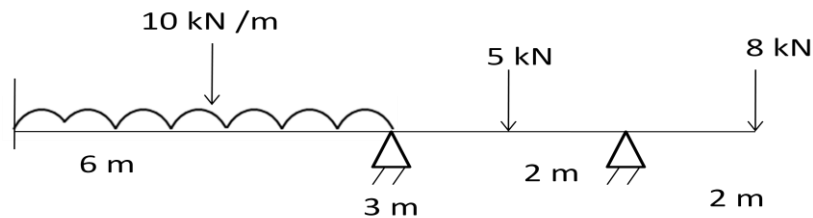


Figure 2

15. (a) Two channel sections with bent lips 200mm x 60mm are connected with webs to act as column. The thickness of channel is 3.2mm. The depth of lips is 25mm. The effective length of column is 4.50m. Determine the safe load carrying capacity of the section. (16)

Or

- (b) Determine the allowable flexural capacity of the  $I$  section shown in figure. The compression flange is adequately laterally supported. Assume that the material conforms to St 42-1079 with yield strength,  $f_y = 2400 \text{ kg/cm}^2$ . (16)

