

Design of Steel Structures - December 2015

TOTAL MARKS: 100

TOTAL TIME: 3 HOURS

- (1) Question 1 is compulsory.
- (2) Attempt any **four** from the remaining questions.
- (3) Assume data wherever required.
- (4) Figures to the right indicate full marks.

1 (a) Explain difference between working stress design and limit state design of steel structures. (8 marks)

1 (b) Explain the advantages and disadvantages of steel structures. (6 marks)

1 (c) Explain briefly about classification of cross section and their characteristics with the aid of moment rotation relationship. (6 marks)

2 (a) With sketches, explain the different failures of bolted connections. (6 marks)

2 (b) Design a bolted connection for a lap joint of plate thickness of 10mm and 12mm to carry a service load of 100kN. Use M₁₆ 4.6 grade bolt. Give the detail with sketch (Assume the bolts as fully threaded). (14 marks)

3 (a) Discuss the main two types of weld commonly used in structural work with sketches. (6 marks)

3 (b) Calculate the factored load that can be supported by bracket connection shown in Fig Q3 (b). Take size of weld as 6mm. (14 marks)

!!MAGE-

4 (a) Explain the terms: (6 marks)

- i) Plastic moment
- ii) Plastic hinge
- iii) Shape factor
- iv) Collapse mechanism.

4 (b) Analyze the continuous beam shown in Fig Q4(b). (14 marks)
Calculate maximum plastic moment.
:!MAGE-

5 (a) What are lug angles? Explain design principle of lug angle. (6 marks)

5 (b) Design a single angle section to carry a service tensile load of 120kN. Use M₂₀ 4.6 grade bolt (Fully threaded). (14 marks)

6 Design a built up column consisting of two channel section placed back to back carrying an axial factored load of 1400 kN. Effective length of column is 5m and also design lacing, sketch the details. (20 marks)

7 (a) Design a slab base of a column ISHB 300@58.8 kg/m. Subjected to carry a working load or 1500kN. The grade of concrete for pedestal is M₂₀ and SBC of soil is 180 N/m². Design also length of weld required. (8 marks)

7 (b) Design a gusseted base for a column to carry an axial factored load of 3000kN. The column is ISHB 400@77.4 kg/m, with two cover plates of 250×20mm on either side. Use M₂₂ property class 5.6 bolts. Sketch the base showing the detail of bolts. (12 marks)

8 (a) Explain web crippling and web buckling in flexural member. (6 marks)

8 (b) A roof of a hall measuring $6\text{m} \times 15\text{m}$ consists of 120mm thick R.C slab supporting on steel I section spaced at 3 mc/c . The hall is having wall of 300mm thickness all around. The finishing load on the roof is 1.5 kN/m^2 and super imposed load is 2 kN/m^2 . Design the steel beam with all necessary checks (Web crippling and buckling need not be done),

(14 marks)

stupidstupid.com