

Sixth Semester B.E. Degree Examination, June/July 2018

Design of Steel Structural Elements

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
 2. Use of IS:800-2007, SP(6)-I or Steel table is permitted.

Module-1

- 1 a. What are the advantages and disadvantages of steel structures? (08 Marks)
- b. What are rolled steel sections? Mention any six shapes used as structural elements with sketches. (08 Marks)

OR

- 2 a. Identify plastic hinge distance 'X' is 0.414l from the simple support of a propped cantilever beam supporting a UDL of w kN/m over the entire span. (08 Marks)
- b. Analyse the continuous beam ABC subjected to working loads shown in Fig.Q2(b) and determine the maximum plastic moment. Take load factor of 1.85. (08 Marks)

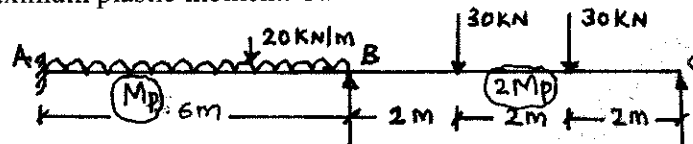


Fig.Q2(b)

Module-2

- 3 a. What are HSFG bolts? What are the advantages of HSFG bolts? (06 Marks)
- b. Design a bolted connection for a lap joint of plate thickness 10 mm and 12 mm to carry a factored load of 150 kN. Use M16 and 4.6 grade bolt. Assume the bolts as fully threaded. (10 Marks)

OR

- 4 a. What are the advantages and disadvantages of welded connections? (08 Marks)
- b. 18 mm thick plate is joined to a 16 mm thick plate by 200 mm (Effective) butt weld. Determine the strength of joint if, (i) A double V-butt weld is used (ii) A single V-butt weld is used. Take $f_u = 410 \text{ N/mm}^2$ and $\gamma_{mw} = 1.25$. (08 Marks)

Module-3

- 5 a. Explain Laced and Battened columns with sketches. (06 Marks)
- b. Determine the design strength of a column section ISHB 350@67 kg/m. The column is 3m height with one end fixed and other end hinged. Take $f_y = 250 \text{ N/mm}^2$. (10 Marks)

OR

- 6 Design a compression member using double channel section (2ISLC300@33.1 kg/m) face to face to carry a factored load of 1600 kN. The length of the column is 5 m with one end fixed and one end hinged. Assume M18 bolts and $f_{cd} = 200 \text{ N/mm}^2$. Also design single lacing system. (16 Marks)

Module-4

- 7 a. What is lug angle? Explain briefly with sketch. (04 Marks)
b. A single unequal angle ISA 100×75×6 mm is connected to 10 mm thick gusset plate with six 16 mm ϕ bolts to transfer tension. Determine design tensile strength if longer legs are connected to gusset. Assume pitch and edge distance of 40 mm each. (12 Marks)

OR

- 8 a. Briefly explain types of column bases. (04 Marks)
b. Design a slab base for a column ISHB 300@58.8 kg/m subjected to a service load of 1500 kN. The grade of concrete for pedestal is M₂₀ and SBC of soil is 180 kN/m². Design slab base and concrete base with welded connection. (12 Marks)

Module-5

- 9 A floor of hall measuring 9m × 21m is of 150 mm thick R.C. slab supported on steel beams [I section] spaced at 3.5 m c/c. The finishing load of floor is 1.5 kN/m² and live load is 3 kN/m². Design the steel beam and apply the necessary checks. Assume self weight of beam = 1 kN/m and thickness of wall = 0.3 m. (16 Marks)

OR

- 10 Simply supported beam ISMB 350@52.4 kg/m is used over a span of 5 m. The beam carries an Udl live load of 20 kN/m and dead load 15 kN/m. The beam is laterally supported throughout check the safety of the beam. (16 Marks)

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