

# CBCGS SCHEME



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15CV62

**Sixth Semester B.E. Degree Examination, Jan./Feb. 2021**

## Design of Steel Structural Elements

Time: 3 hrs.

Max. Marks: 80

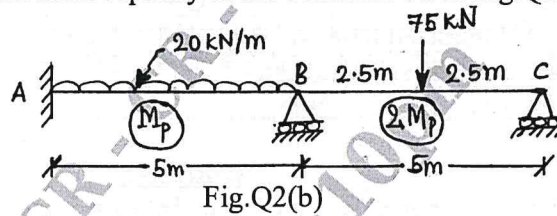
- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
 2. Use of IS:800-2007 and SP:6(1)-1964 or steel table is permitted.

### Module-1

- 1 a. Mention any four advantages and four disadvantages of steel structures. (08 Marks)
- b. Briefly explain the different loads used in the steel structural design and also the combinations of loads. (08 Marks)

OR

- 2 a. Determine the shape factor of a rectangular section of breadth 'b' and depth 'd'. (06 Marks)
- b. Determine the plastic moment capacity of the beam shown in Fig.Q2(b).



(10 Marks)

### Module-2

- 3 a. Write a short note on HSFG bolt. (04 Marks)
- b. Two plates 10 mm and 18 mm thick are to be jointed by double cover butt joint. Design the joint for the following data:
  - (i) Factored design load = 750 kN
  - (ii) Bolt diameter = 20 mm
  - (iii) Grade of steel = Fe410
  - (iv) Grade of bolts = 4.6
  - (v) Cover plates 2 (one on each side) = 8 mm thick(12 Marks)

OR

- 4 a. A tie member of a truss consists of double angle section, each 80 mm × 80 mm × 8 mm welded on the opposite side of a 12 mm thick gusset plate as shown in Fig.Q4(a). Design a fillet weld for making connection in the workshop. The tensile force in the member is 400 kN.

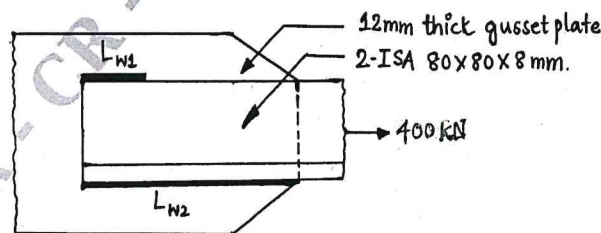


Fig.Q4(a)

(12 Marks)

- b. What are advantages of welded connections over bolted connections? (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. Explain the possible failure modes of an axially load column. (04 Marks)  
b. Determine the design axial load on the column section ISMB 350, given that the height of the column is 3.0 m and both ends are hinged. Given  $f_y = 250 \text{ N/mm}^2$ ,  $f_u = 410 \text{ N/mm}^2$ ,  $E = 2 \times 10^5 \text{ N/mm}^2$ . (12 Marks)

**OR**

- 6 Design a 8m long built-up laced column to carry a factored axial load of 1250 kN. The column is restrained in position but not in direction at each end. Provide a single lacing system making connections with 16 mm diameter bolts. The column shall consists of two channels placed toe to toe at a suitable spacing. (16 Marks)

**Module-4**

- 7 Design a single angle section to carry a factored tensile force of 200 kN. Bolts of 20 mm diameter are to be provided for the connection of the member to the gusset plate. Take  $f_y = 250 \text{ N/mm}^2$ ,  $f_u = 410 \text{ N/mm}^2$ . The design strength of a 20 mm diameter bolt = 45.3 kN. (16 Marks)

**OR**

- 8 Design a bolted gusseted base which consist of a column of ISHB 200@ 40 kg/m along with a cover plate on both sides carrying a factored load of 2500 kN. The grade of concrete is M20 and SBC of soil is 220 kN/m<sup>2</sup>. (16 Marks)

**Module-5**

- 9 Design a simply supported beam of span 5m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 20 kN/m imposed load and 20 kN/m dead load. The section is stiff against bearing. Assume Fe 410 grade steel. (16 Marks)

**OR**

- 10 Design a simply supported beam of span 3m. The beam is subjected to a factored bending moment of 250 kN-m and factored shear force of 120 kN. The beam is laterally unsupported. (16 Marks)

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