CBCS 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).

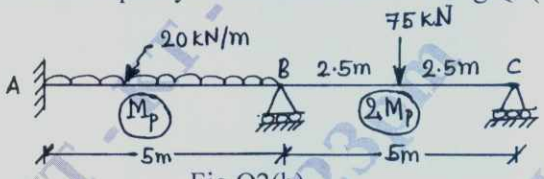

Fig.Q2(b) **(10 Marks)**

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.

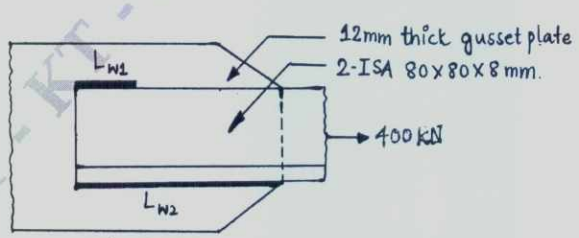

Fig.Q4(a) **(12 Marks)**

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

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 $f_y = 250\ N/mm^2$, $f_u = 410\ N/mm^2$, $E = 2 \times 10^5\ N/mm^2$. **(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 $f_y = 250\ N/mm^2$, $f_u = 410\ N/mm^2$. 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^2. **(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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