CBCS SCHEME

USN | | | | | | | | | | |

21CV63

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Design of Steel Structural Elements

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS800 : 2007, steel table is permitted.

Module-1

1 a. Explain the failure criteria of steel. **(10 Marks)**

b. Explain briefly the classifications of cross sections. **(10 Marks)**

OR

2 a. Calculate the shape factor for the triangular section. **(10 Marks)**

b. Calculate the plastic moment capacity required for continuous beam subjected to working load as shown in Fig.Q.2(b). Take load factor = 1.5. **(10 Marks)**

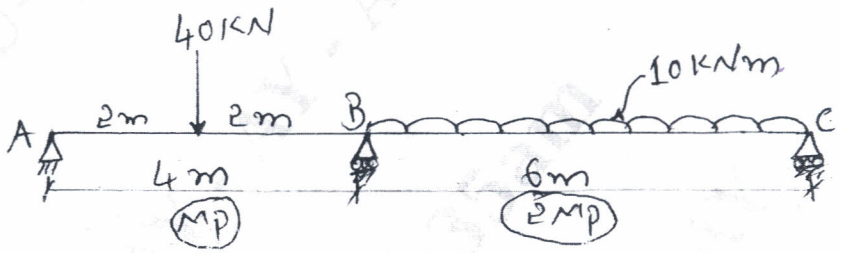

Fig.Q.2(b)

Module-2

3 a. Explain with neat sketches various modes of failure of bolted connections. **(10 Marks)**

b. Design a bolted connection for a lap joint between plates of size 100 × 16 mm and 100 × 10 mm to transmit a factored load of 100 kN using single row of bolts of grade 4.6 and grade 410 plate. Assume e = 30 mm and diameter of bolt = 16 mm. **(10 Marks)**

OR

4 a. Explain briefly the common defects in welding with neat sketches. **(10 Marks)**

b. Design a fillet weld for the angle section ISA 80 mm × 50 mm × 8 mm. welded to a 12 mm thick gusset plate at site. Assume that welding is done on 3 sides. Take Fe 410 grade steel. **(10 Marks)**

Module-3

5 a. Explain the possible modes of failure of axially loaded columns. **(10 Marks)**

b. Determine the design axial load on the column section ISMB 450 @ 710.2 N/m, length of column is 4 m and it is hinged at both ends. Assume $f_y = 250$ N/mm^2. **(10 Marks)**

OR

6 Design a double angle discontinuous strut to carry a factored load of 135 kN, resulting from combination of wind load. The length of the strut is 3 m between intersections. The two angles are placed back to back (with two long legs connected) and are tack bolted. Use Fe 410 grade steel.

i) Angles are placed on the opposite sides of a 12 mm gusset plate.

ii) Angles are placed on the same sides of a 12 mm gusset plate. **(20 Marks)**

Module-4

7 a. Explain the factors affecting the strength of tension members. **(10 Marks)**

b. Determine the tensile strength of the plate 150 mm × 10 mm connected to 12 mm thick gusset plate using 6 numbers of M16 bolts in two rows. 3 number of bolts in each row with pitch = 60 mm, end distance = 30 mm, gauge distance = 90 mm. Use property class 4.6 bolts, $f_u = 410$ N/mm^2. **(10 Marks)**

OR

8 a. Explain lug angles and column splices. **(10 Marks)**

b. Design a slab base for a column ISHB 300 @ 577 N/m carrying an axial factored load of 1000 kN. M20 concrete is used for the foundation. Provide welded connection between column and base plate. **(10 Marks)**

Module-5

9 a. Explain briefly the design steps followed while designing laterally supported beam as per IS 800 : 2007. **(10 Marks)**

b. Determine the design bending strength of a beam ISMB 300 @ 433.6 N/m. Use Fe 410 grade steel. **(10 Marks)**

OR

10 Design a cantilever beam built into a concrete wall. It supports a dead load (including self weight) of 18 kN/m and a live load of 12 kN/m. The effective span of beam is 4.5 m. Beam is laterally supported. Take $f_y = 250$ N/mm^2, $E = 2 \times 10^5$ N/mm^2. Also check for web buckling web crippling. **(20 Marks)**

* * * * *