

# CBCS SCHEME

15CV72

USN

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2023 Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any TWO questions, choosing ONE full question from each module.  
2. Use of IS-456, IS-800, SP(6), steel tables and SP(16) may be permitted.*

### Module-1

- 1 Design a cantilever retaining wall to retain earth embankment 4m above the existing ground level. Density of the soil is  $18\text{kN/m}^3$ . Angle of internal friction between soil particles is  $30^\circ$ . Safe bearing capacity of the foundation soil may be taken as  $200\text{kN/m}^2$ . Coefficient of friction between soil and concrete surface is 0.5. The design must include all the necessary checks. Use M20 grade concrete and Fe-415 steel. Write a neat sketch of reinforcement details in stem, Toe and heel slab. (40 Marks)

OR

- 2 Design the portal frame with fixed base for the following details. Spacing of the portal frame is 4m c/c. Centre to centre distance between columns of the frame is 8m. Height of the column measured between top of footing to the axis of the beam is 4m. The thickness of roof slab supported by portal frame is 120mm. Live load acting on the roof is  $1.5\text{kN/m}^2$ . Use M20 grade concrete and Fe-415 steel. Safe bearing capacity of the foundation soil is  $150\text{kN/m}^2$ . The existing ground level is 0.6m above the top surface of the footing. Analyze the portal frame by suitable classical methods and hence design the column, beam and footing with all necessary checks and write a neat sketch reinforcement details. (40 Marks)

### Module-2

- 3 Design the top chord, bottom chord, main sling member and support joint of a roof truss with its geometry as shown in Fig.Q.3. The analyzed forces in various members due to dead load, live load and wind load is furnished in Table Q.3. Determine the maximum design forces in the members due to various combination of loads with partial safety factors as per IS-800. Use 18mm diameter bolts of grade 4.6 for all the connections. The cross section dimension of the supporting reinforced concrete columns at the ends are  $230\text{mm} \times 300\text{mm}$  with 300mm edge placed parallel to plane of the truss. The design must comprise of all the necessary checks and write a neat sketch of design details. M20 grade concrete is used in the supporting columns.

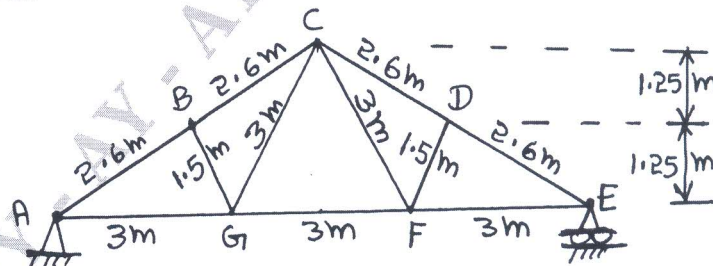


Fig.Q.3

Table Q.3

Members	Dead load forces kN	Live load forces kN	Wind load forces kN
AB, BC, CD, DE	-68.0	-62.5	+181.6
AG, GF, FE	+62.0	+57.0	-152.4
BG, DF, CG, CF	+30.0	+28.4	-73.0

Note: - = Compressive Force  
+ = Tensile Force.

(40 Marks)

OR

- 4 Design a welded plate girder with thick web plate without having intermediate transverse stiffeners. Effective span of the girder is 21m and the girder is subjected to uniformly distributed service load of 60kN/m inclusive of its self weight in addition to two concentrated loads of magnitude 500kN each, placed at one third and two third span points. The girder is laterally supported for its entire span. Design the components such as web plate, flange plate and bearing stiffness. Design the joints with continuous fillet weld and all the design process must ensure the necessary safety checks. Write a neat sketch of design details. (40 Marks)

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