[Total No. of Questions: 09] [Total No. of Pages: 03]

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)

Semester: 5th

Name of Subject: Structural Engineering

Subject Code: PCCE-113

Paper ID: 16390

MORNING

12 MAY 2023

Scientific calculator is allowed.

Use of IS 456: 2000, IS 800:2007 and Steel Table is allowed.

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1. Parts A and B are compulsory
2. Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3. Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

1.

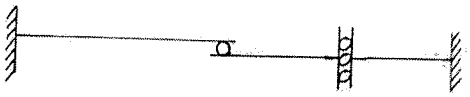
a. Distinguish between a planar structure and space structure.

b. Write down the assumptions made for analysis of truss structures.

c. Why there is limit of maximum and minimum percentage of longitudinal steel in columns?

d. Describe how constructional error of lack of fit affects the structure.

e. Define Degree of redundancy. Find degree of redundancy of following structure.



f. Explain why nominal shear steel is provided in RC beams?

Part – B

[Marks: 04 each]

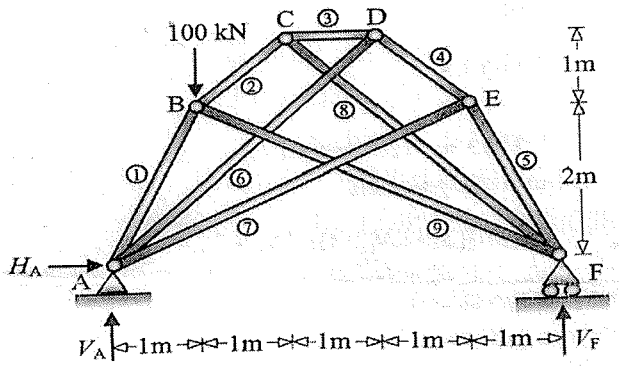
2. A cantilever is loaded uniformly on whole span with 10 kN/m and a point load of 20 kN at free end. Calculate the maximum deflection and slope. The cantilever is 3 m long, 100 mm wide and 300 mm deep.

3. Design an isolated footing of uniform thickness of a RC column bearing a vertical load of 600 kN and have base size 500 × 500 mm. The SBC of soil is 120 kN/m^2. Use M20 and Fe415 as materials.

4. Design a stanchion 3.5 m long, in a building, subjected to a factored load of 550 kN. Both ends of the stanchion are effectively restrained in direction and position. Use steel of grade Fe 410.

5. Consider a prismatic cantilever beam AB, fixed at A and free at B, with span L and flexural rigidity EI. Sketch the variation of curvature, bending moment and shear force along the length of the beam if it is subjected to uniformly varying load with maximum intensity of q_0 starting from end A.

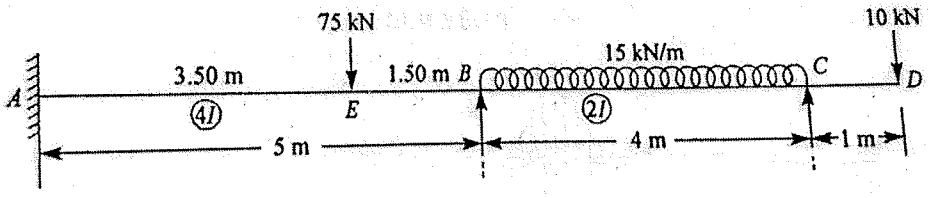
6. For the following compound truss, find the forces in members 1, 3 and 5.



7. Design a simply supported rolled steel laterally restrained beam to carry a distributed load of 60 kN/m over a span of 5 m. Adopt Fe 410 grade of steel. Use $f_y = 250$ N/mm^2.

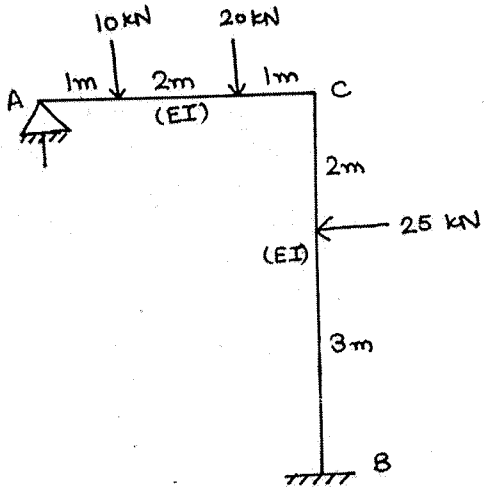
Part – C **[Marks: 12 each]**

8. Apply a suitable method to solve for reactions of following beam. Also draw shear force and bending moment diagrams.



OR

Apply Unit load method to solve following portal frame:



9. Design a simply supported slab over a hall of size 4m × 8 m. The slab is supported on 230 mm thick masonry walls. The slab is subjected to a live load of 4 kN/m^2 and a surface finish of 1 kN/m^2. Assume M25 concrete and Fe500 grade steel. The exposure of slab is moderate and there is no chance of fire.

OR

Design a short column to carry a factored axial load of 1000 kN. Use $f_{ck} = 20$ MPa and $f_y = 415$ MPa. Also design lateral ties and sketch reinforcement details.

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