133CM04 – ASSIGNMENT (Summer) 2016/2017 Name:…… Group:……

Assignment no. 1: Design of irregularly shaped slab

Design of main bending reinforcement for the irregularly shaped slab.

Geometry of the structure – compulsory parts:

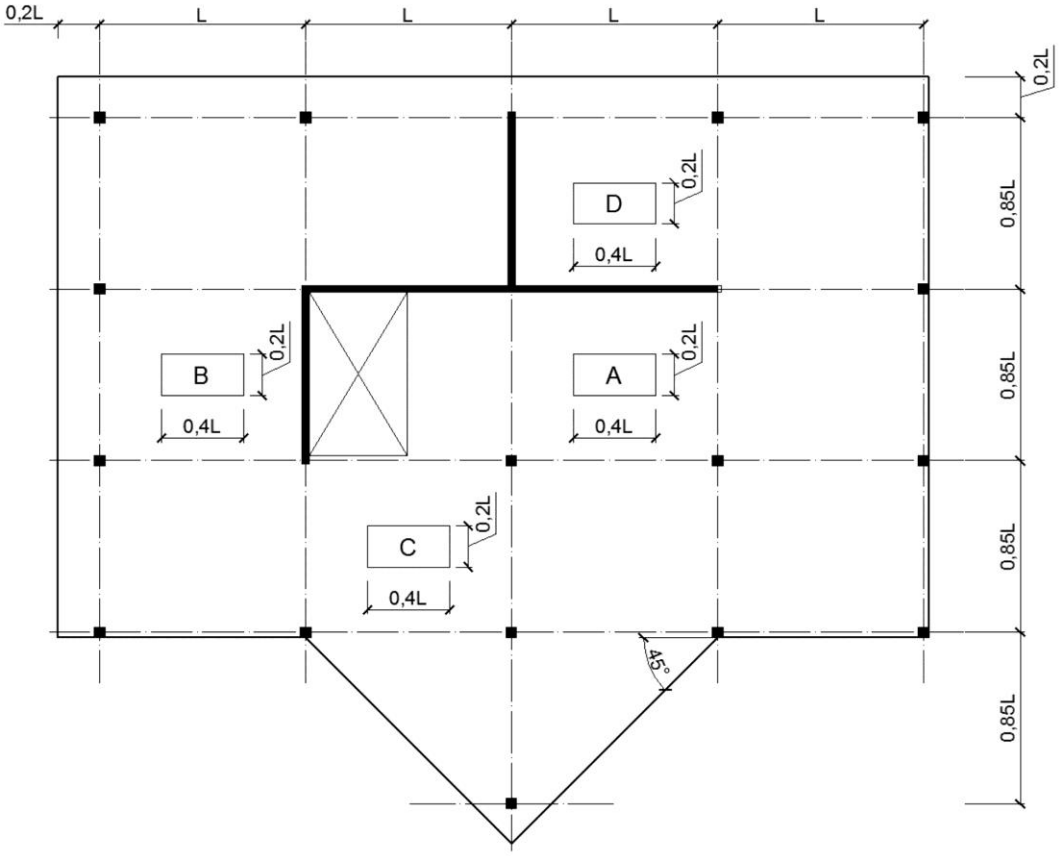
- slab has to be asymmetric
- slab partially supported by columns
- supporting wall
- floor cantilever
- floor opening
- uniformly distributed load

Please, work out:

1) Calculation model in software
2) Software drawing
    a. finite element mesh (plan view)
    b. deformation (plan view + one sectional view)
    c. distribution of bending moments m_x and m_y (plan view + one sectional view)
    d. distribution of torsion moments m_{xy} (plan view + one sectional view)
3) Depiction of isolines of the zero bending moments m_x and m_y made in hand
4) Hand calculation of bending moments m_x and m_y (in one span)
5) Identification of one slab part with significant torsion moment
6) Calculation of design moments
7) Depiction of diagram m_φ, $m_{Rd\varphi}$ and $m'_{Rd\varphi}$ (φ=0°~180°) made in hand
8) Design and check of bending reinforcement (USL) in part of the slab where the design moments were determined – hand calculation
9) Design and check of bending reinforcement (USL) in the whole slab – table in spreadsheet software
10) Hand made sketch of lower and upper reinforcement of the whole slab (min. two drawings)

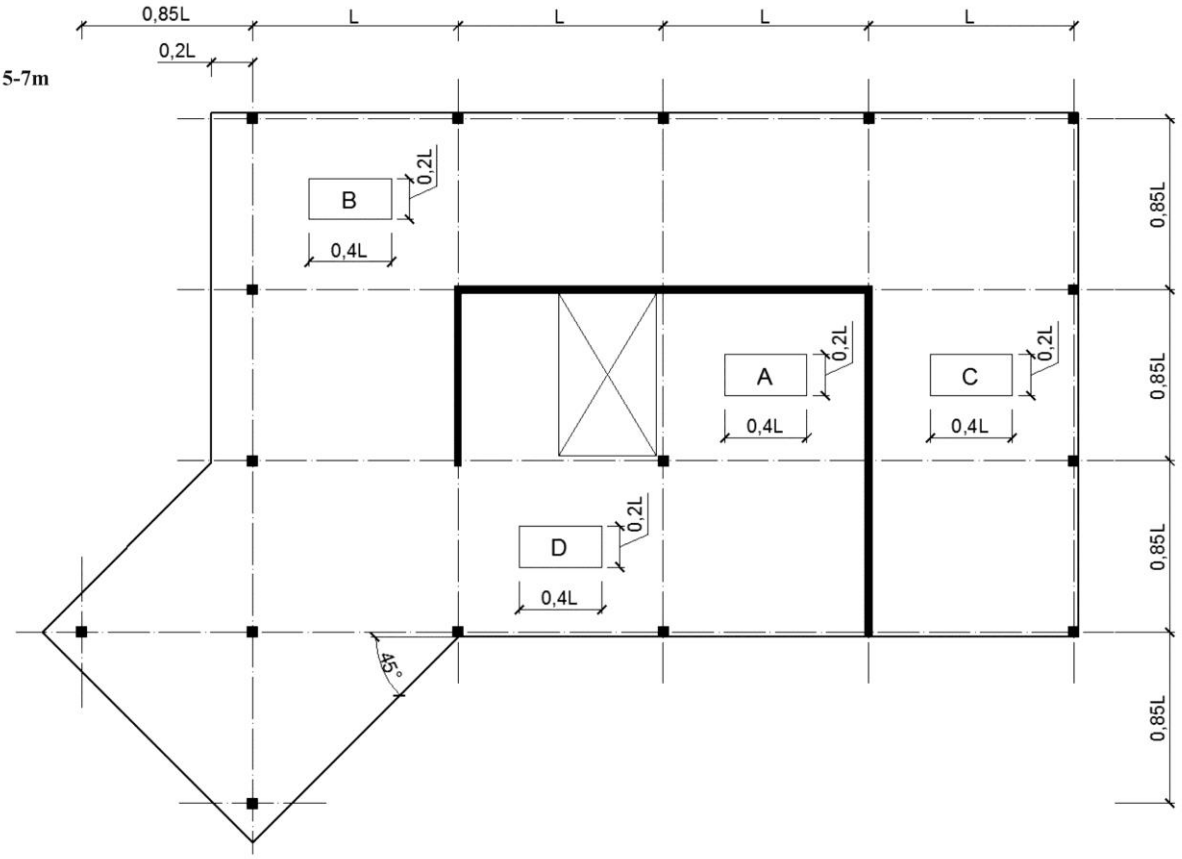
Sample: 1

L = 5-7m



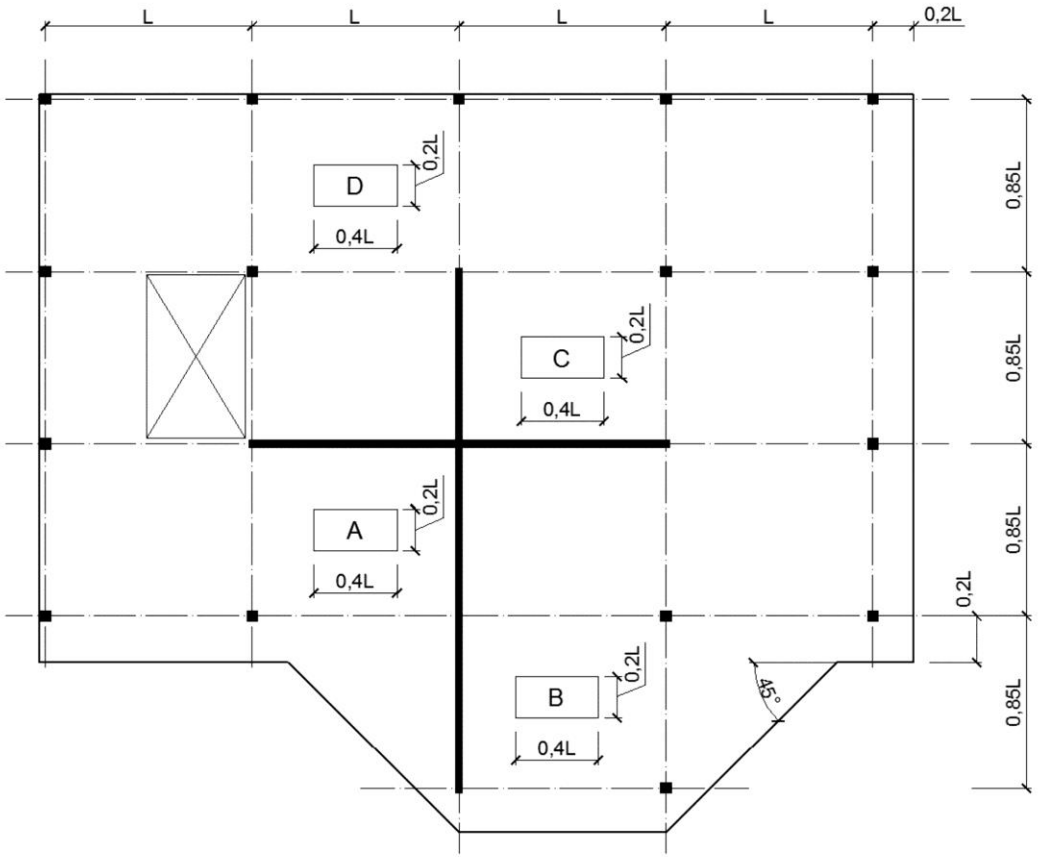
Sample: 2

L = 5-7m



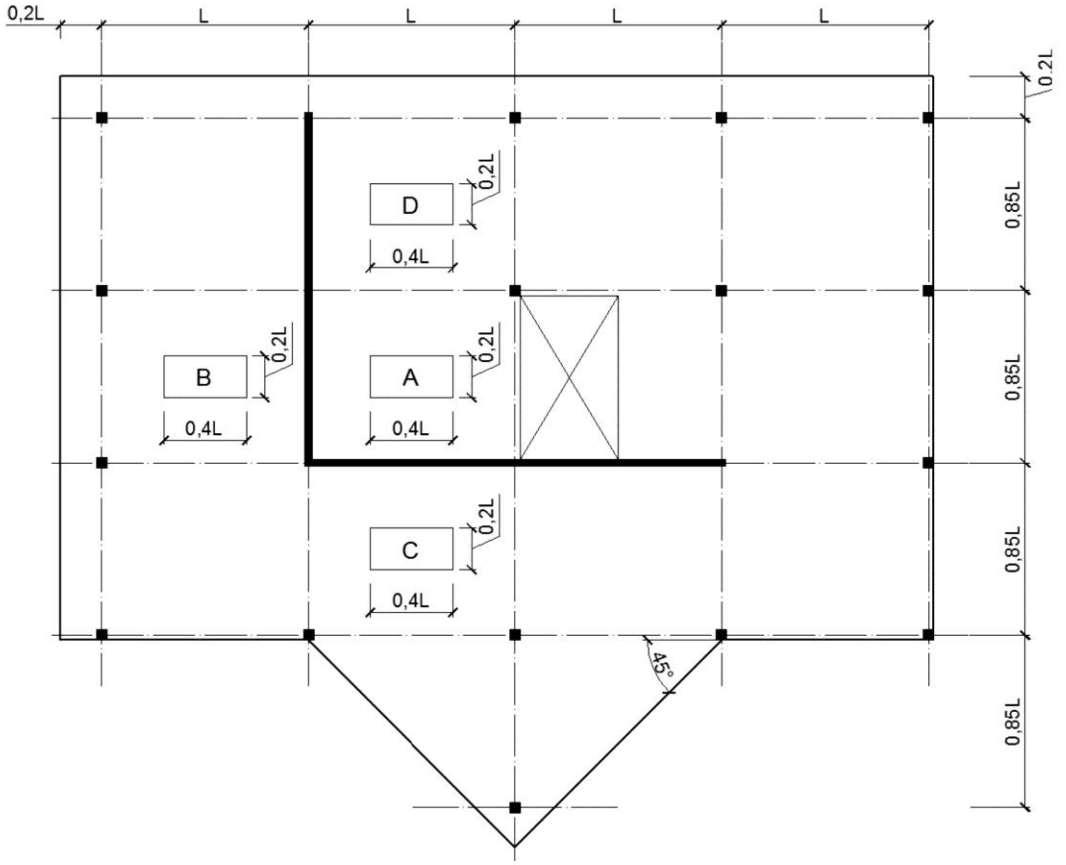
Sample: 3

L = 5-7m



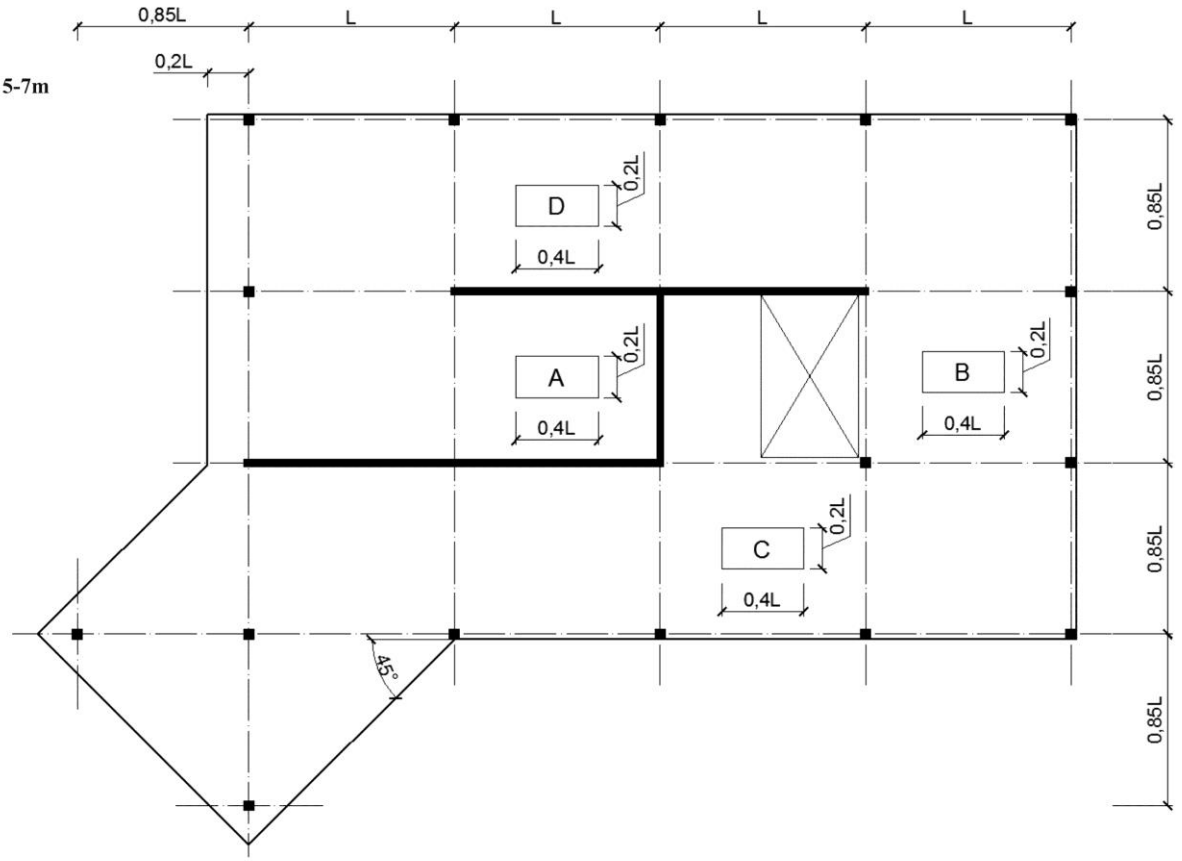
Sample: 4

L = 5-7m



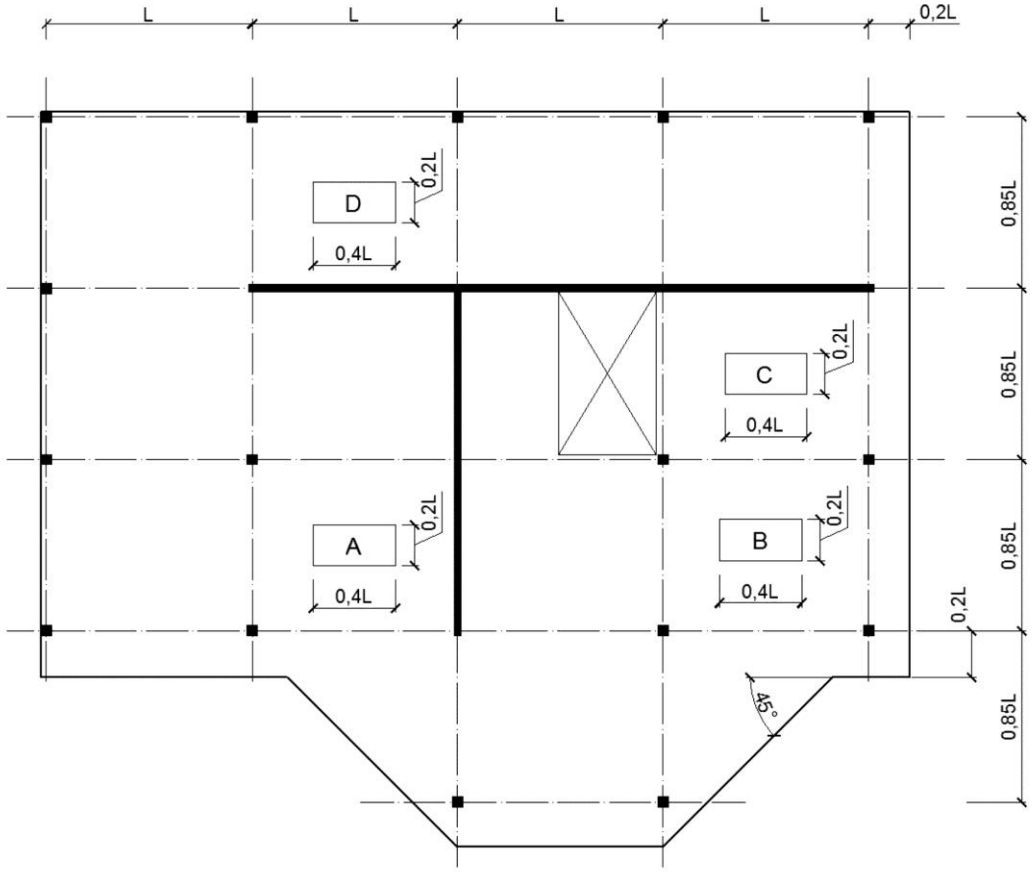
Sample: 5

L = 5-7m



Sample: 6

L = 5-7m



133CM04 – ASSIGNMENT (Summer) 2016/2017 Name:…… Group:……

Assignment no. 2: Design of wall with opening

Design of the main reinforcement for the wall with opening.

Geometry of the structure – compulsory parts:

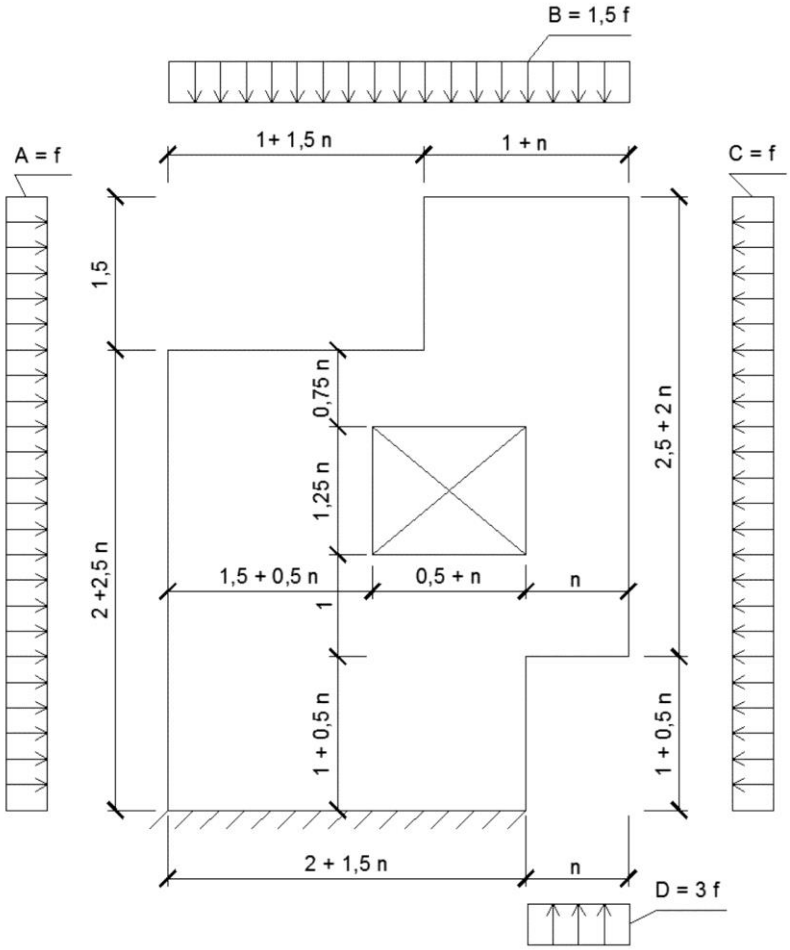
- adequate design complexity
- wall opening min. 1x1 m in adverse area
- uniformly distributed load action on one edge (fully or partially)

Please, work out:

1) Calculation model in software
2) Software drawing
    a. finite element mesh (side view)
    b. deformation (side view)
    c. distribution of stresses σ_x, σ_y and shead stress τ_{xy} (side view)
3) Deformation of the structure made in hand
4) Trajectory of principal stresses made in hand
5) Identification of one point with significant shear stress
6) Calculation of the design stresses
7) Depiction of diagram σ_φ, $f_{td\varphi}$ and $f_{cd\varphi}$ (φ=0°~180°) made in hand
8) Design and check of reinforcement (ULS) in the part of the wall where the design stresses were determined – hand calculation
9) Design and check of reinforcement (ULS) in the whole wall – table in spreadsheet software
10) Hand made sketch of reinforcement of the whole wall

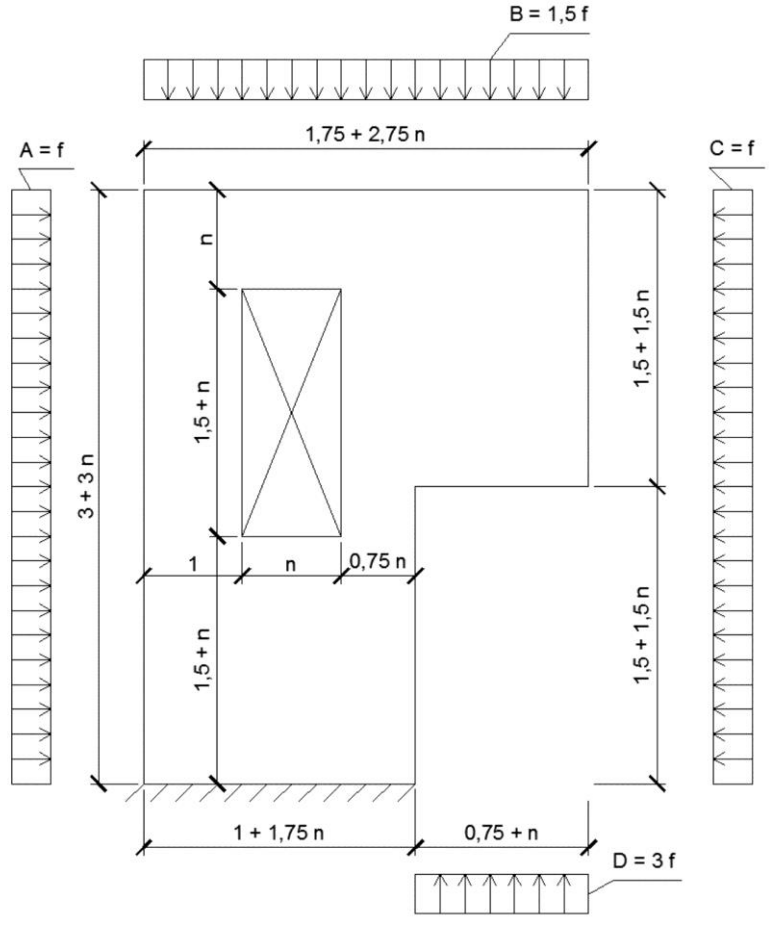
Sample: 1

n = 1-3m



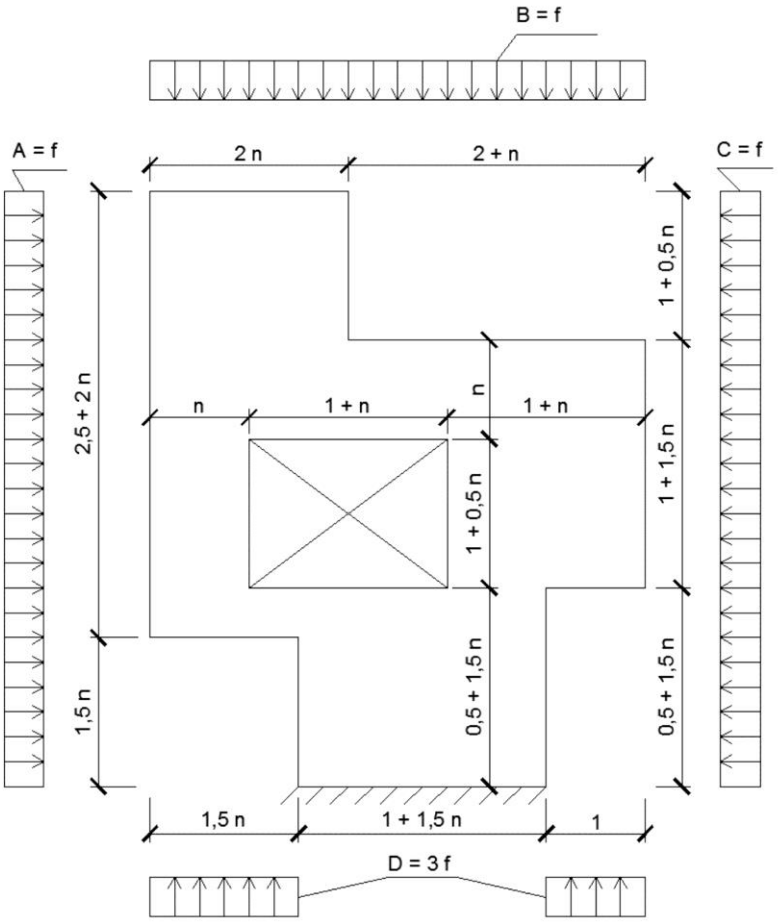
Sample: 2

n = 1-3m



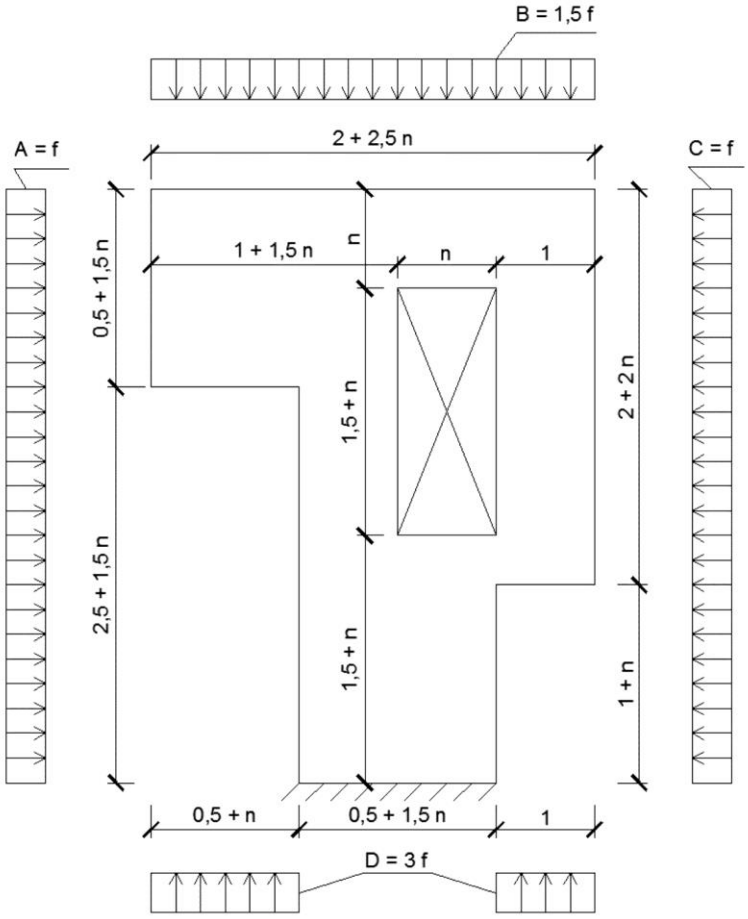
Sample: 3

n = 1-3m



Sample: 4

n = 1-3m

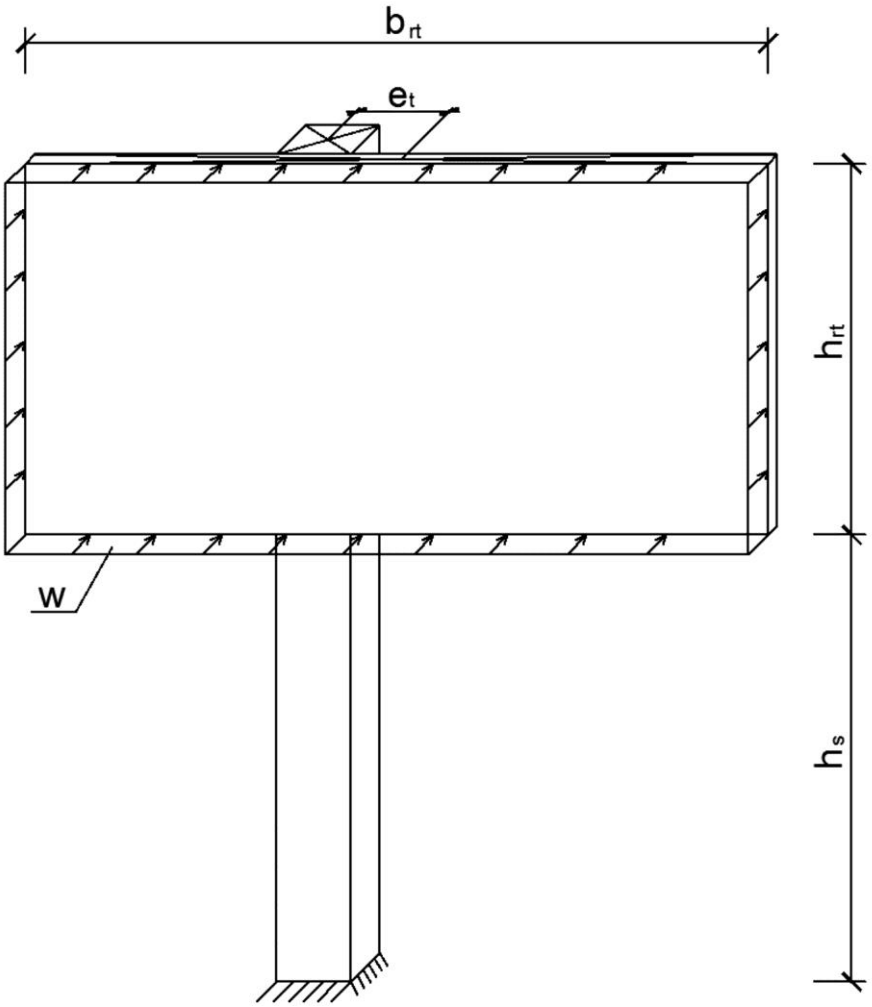


133CM04 – ASSIGNMENT (Summer) 2016/2017 Name:…… Group:……

Assignment no. 3: Design of the column with eccentrically an attached advertising board

Design of the reinforced concrete column with eccentrically attached an advertising board. In the design, consider the height of the column, the dimensions of advertising board and loads according to specification.

- Column height h_s = …… m
- Board height h_{rt} = …… m
- Board width b_{rt} = …… m
- Eccentricity of board gravity e_t = …… m
- Self-weight od board F_{rt} = …… kN
- Wind load w = …… kN/m^2



Please, work out:

1) Internal forces calculation
2) Design and check of beam reinforcement with considering of all internal forces (N+My+V+Mx)
3) Sketch of bending and shear reinforcement

133CM04 – ASSIGNMENT (Summer) 2016/2017 Name:…… Group:……

Assignment no. 4: Design of reinforcement using the strut-and-tie model

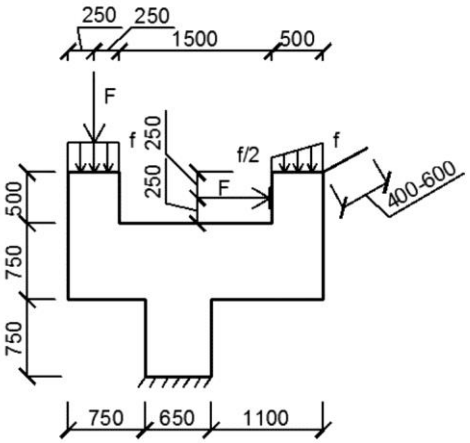
Design of reinforcement in concrete structures according to specification.

- Structure no. ……
- Point force F = …… kN
- Continuous load f = …… kN/m

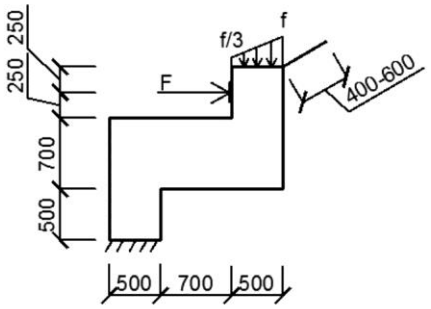
Please, work out:

1) Depiction of deformation of the structure
    a. made in hand (without software)
    b. software drawing
2) Depiction of trajectory of principal stresses
    a. made in hand (without software)
    b. software drawing
3) Probable cracks (made in hand)
4) Design of suitable strut-and-tie model
5) Design of reinforcement for the specified load condition
6) Check loadbearing capacity of one strut, one tie and one node
7) Sketch of reinforcement of the structure

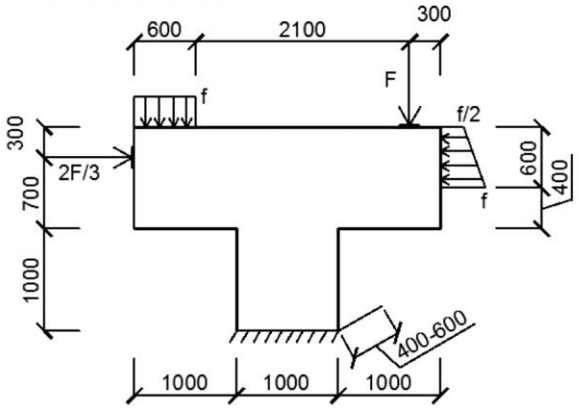
Structure no. 1



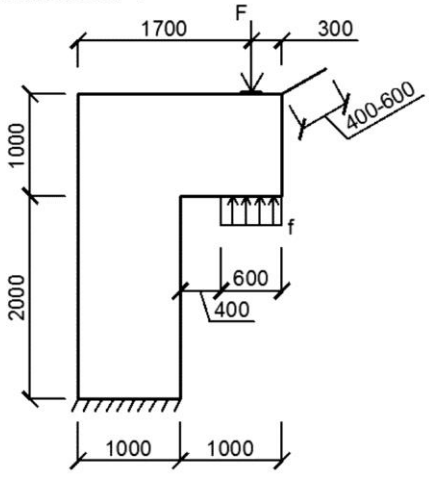
Structure no. 2



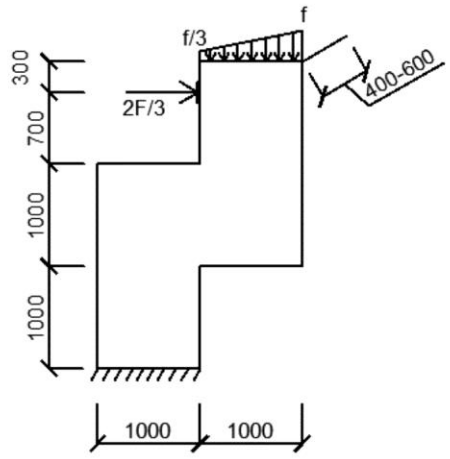
Structure no. 3



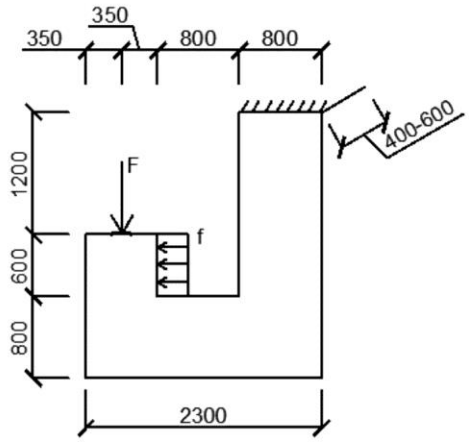
Structure no. 4



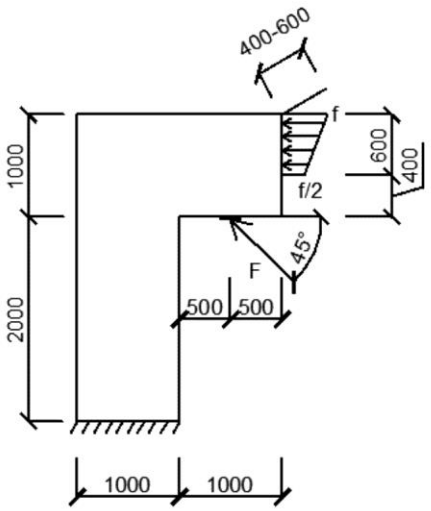
Structure no. 5



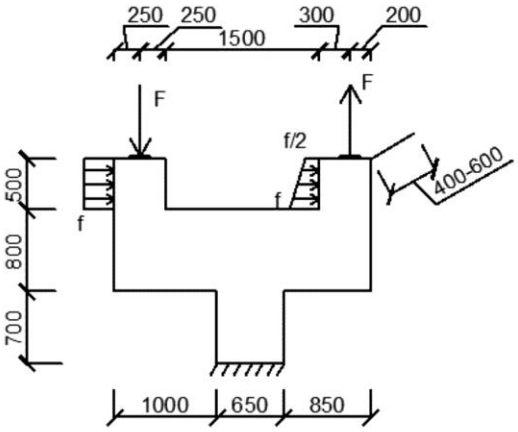
Structure no. 6



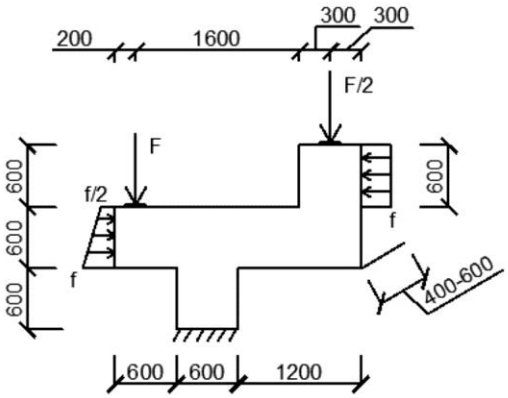
Structure no. 7



Structure no. 8



Structure no. 9



Structure no. 10