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DEPARTMENT OF MATHEMATICS

Mathematics Lab Assessment No. 2

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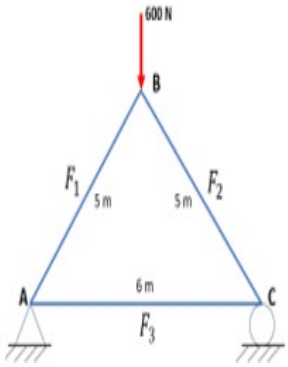
Question

For a triangular truss with three members: AB, AC, and BC, with
Joint A is a pinned support (provides horizontal and vertical reactions).
Joint C is a roller support (provides only vertical reaction).
A vertical load of 600 N is applied at joint B (the apex of the triangle).
AB = BC = 5 m; AC = 6 m; Height = 4 m
Find the axial forces F_1, F_2, F_3

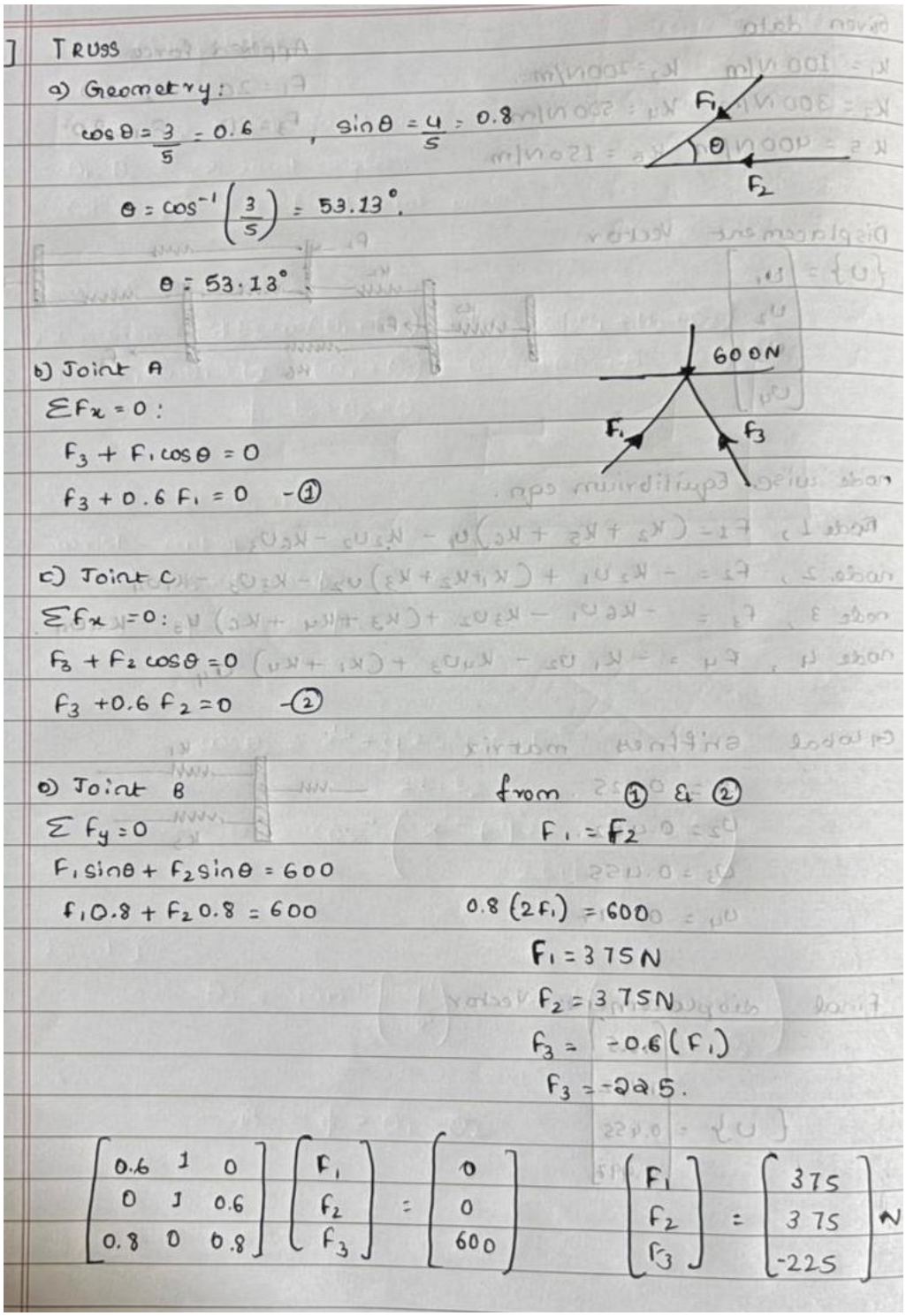


Solution

i) Identify the parameters and mathematical concept

- Truss type: Planar triangular truss
- Members: AB, BC, AC
- Joints: A, B, C
- Support at A: Pinned (horizontal & vertical reactions)
- Support at C: Roller (vertical reaction only)
- Load: 600 N downward at joint B
- Dimensions:
- AB = BC = 5 m
- AC = 6 m
- Height = 4 m
- Unknown axial forces:
- F_1 in AB
- F_2 in BC
- F_3 in AC
- Mathematical concept used:
  Equilibrium of forces + trigonometry + system of linear equations (matrix method)

ii) Solve analytically



iii) GeoGebra Screenshot / Program Execution

```
import numpy as np
#Coefficient Matrix
A=np.array([[0,4/5,4/5],
            [-1,0,-3/5],
            [1,3/5,0],
            ])
#vector b
B=np.array([600,0,0])

#Solution
S=np.linalg.solve(A,B)
print(S)
```

iv) Results and analysis from the graph

```
...  [-225.  375.  375.]
```