Scientific Python Developer Test

git repo : https://github.com/yusha-g/Structural-Engineering-Calculations

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1. Files

The assignment utilizes 3 files.

GLOBAL_VAR.py

- Some variables are required across modules.
- These common variables are stored in GLOBAL_VAR.py
- All values must be initialised (`GLOBAL_VAR.set_variables()`) before proceeding with beam verification.
- ***NOTE: value of M is given in kN m, the input must be given in N m (x 1000)***

beam_verifier.py

`INPUT: None`

`OUTPUT: utilityRationForFlexture`

- Since all required values are initialised in GLOBAL_VAR, no parameters need to be passed.
- It calculates the following values for moment capacity calculator:
    - a_fromTop, a_fromBott
    - a_max_fromTop, a_max_fromBott,
    - dFromTop, dFromBott
    - alpha1

moment_capacity.py

`INPUT:`

- The following values are imported from beam_verifier:
    - a_fromTop, a_fromBott
    - a_max_fromTop, a_max_fromBott,
    - dFromTop, dFromBott
    - alpha1

- The following values are inputted globally:
    - fy, f'c
    - As_bott_prov, As_top_prov
    - bw
    - covTop, covBott

`OUTPUT: M_cap`

- After calculations, it return the **M_cap** value to beam_verifier.py

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2. Discrepancies in SMath Files

2.1 Test Outputs

- In developer_test.sm we are given the following values:
    - fy = 500
    - f_c = 40
    - As_top_prov = 1000
- However, in moment_capacity.sm, we are given a different set of test values:
    - fy = 675
    - f_c = 45
    - As_top_prov = 525
- Upon calculation, the following values are attained:

	developer_test	*moment_capacity*
a_max_fromBott / a_max_fromTop	138.6	113.3647
a_fromTop	134.0196	160.8235
a_fromBott	49.0196	30.8824
beta1	0.77	0.73
M_design	1 x 10^5	1 x 10^5
M_cap	1.5032 x 10^8	1.1813 x 10^8
utilityRatioForFlexture	0.6652 x 10^-3	0.8465 x 10^-3

So, the given test output for utilityRatioForFlexture is valid for the set of inputs in moment_capacity.sm

2.2 Omission of Exponent in utilityRatioForFlexture

- As mentioned above, the value of test output value is coming to 0.8465 x 10^-3
- However, only 0.8465 is mentioned in the document.

2.3 Input Categorization in Moment Capacity Calculator

- in moment_capacity.sm variables are categorized into 2:
    - Local inputs
    - Imported Inputs (from developer test)

- Among this, dFromTop and dFromBott are categorized as local inputs even though they are calculated in developer_test.
- It would be more fitting if dFromTop and dFromBott were classified as Imported Inputs.
- The code is written assuming the same. moment_capacity imports the variables from developer_test

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3. Testing

- `pytest test_developer.py`
- Two tests are provided with the above mentioned set of values