7.1 Test case 1 Unit tests

1. Test tensor operations

   Aim: Use reference inputs and results to perform assertion test of the subroutines and functions defined in the file tensor_ope_module.for.

   Expected result: In all the cases is expected a positive result in assertion test

   Command used to run the program:

   Before to follow assure that you have properly installed PfUnit4.0 (see the section 3.8). From the main folder change to the folder 1_Test_tensor_op, where you find the following files.

   File to test

   ```
   tensor_ope_module.for
   ```

   Reference data: do not delete any of these files.

   ```
   data_TT01.csv to data_TT08.csv
   generate_values_test.py
   ```

   Files to configurate the test

   ```
   test_tensor_mod.pf
   ./build_with_cmake_and_run.x
   CMakeLists.txt
   ```

   Executable if you don't install pf unit4.0

   ```
   my_test_tensor_op1
   ```

   To Compile the test use the following command.

   ```
   build_with_cmake_and_run.x
   ```

   The package PfUnit generates the folder /build at the time it generates an error message about the test. To see the result of the test it is necessary to use the executable file. For this, change to the folder /build and copy the file my_test_tensor_op1 to the folder 1_Test_tensor_op. Run the executable file.

   ```
   ./my_test_tensor_op1
   ```

   Then in the terminal is printed all the individual test performed by function, and the final message

   ```
   OK
    (1 test)
   ```

   If you don't install Pfunit, the executable my_test_tensor_op1 is one of the files attached in the folder 1_Test_tensor_op

   Obtained result: For 3 functions/subroutines the result in term of tolerance was not satisfactory.

- contrac_2nd_2nd: tolerance=1.e-10
- voig_2_T4th tolerance=0.5e-6
- T4th_2_voig tolerance=0.6e-6

These tolerance values where adjusted in the file test_tensor_mod.pf in order to get the result of all the test. These error probably are due to the lack of experience in good practice programming in Fortran. Similar bug where detected and fixed in other functions during these test.