Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student number\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Assignment 4 (4p)**

Derive the component form of the membrane equilibrium equation  in the spherical shell coordinate system. Assume external loading  due to a pressure difference between the inner and outer surfaces. Also assume rotation symmetry with respect to both angular coordinates so that  where stress components and  are constants. The basis vector derivatives and gradient of the spherical shell coordinate system are given by

, , .

**Answer**  and 