CS 580 Specification of Software Systems

Homework 05: Transpose.

Consider a square matrix B of size N. Let A represent the initial configuration of the matrix B.

(1) Write a UNITY program that transposes the rows and columns of matrix B and preserves the following invariant:

```
inv.   p≤q ∧
       ⟨ ∀ i,j : (1≤i<p ∨ 1≤j<p ∨ q<i≤N ∨ q<j≤N) ∧ 1≤i≤N ∧ 1≤j≤N ::
                  B(i,j) = A(j,i) ⟩
```

(2) Write a formal specification of the correctness of the program you designed. Such a specification often assumes the following general form:

```
a.  init → Post

b.  stable Post
```

(3) Explain in narrative form (no formal proof) the steps involved in proving these two properties.