Problem Q2. *Solution.* Suppose U is an orthogonal upper triangular matrix. Then U has orthonormal columns and also the rows of U are orthonormal. Particularly, this means that norms of both the rows and columns of U are 1. Additionally, the transpose of S is also its inverse. Since U is any orthogonal upper triangular matrix, it must be that it is a diagonal matrix whose main diagonal entries are either 1 or -1.

Now we prove the other direction: Suppose that U is a diagonal matrix whose main diagonal entries are either 1 or -1. From this we can gather that U is square and that the rows and columns of U are orthonormal. Hence, U is an orthogonal matrix whose entries are on the diagonal, thus U is upper triangular as well.