Abstract

A pair of square 0, 1 matrices A, B such that $AB^T = E + kI$ (where E is the n x n matrix of all 1s and k is a positive integer) are called Lehman matrices. These matrices figure prominently in Lehmans seminal theorem on minimally nonideal matrices. There are two choices of k for which this matrix equation is known to have infinite families of solutions. When n = $k^2 + k + 1$ and $A = B$, we get point-line incidence matrices of finite projective planes, which have been widely studied in the literature. The other case occurs when $k = 1$ and n is arbitrary, but very little is known in this case. This paper studies this class of Lehman matrices and classifies them according to their similarity to circulant matrices.