Let $X = UDV^T$. Then

(A) Columns of U are eigenvectors of X^TX

(B) **[Ans]** Columns of V are eigenvectors of X^TX

(C) Rows of U are eigenvectors of X^TX

(D) Rows of V are eigenvectors of X^TX

(E) None of these

Let $X = UDV^T$. Then

(A) **[Ans]** Columns of U are eigenvectors of XX^T

(B) Columns of V are eigenvectors of XX^T

(C) Rows of U are eigenvectors of XX^T

(D) Rows of V are eigenvectors of XX^T

(E) None of these

Consider X to be a square matrix of size $n \times n$ and $X = UDV^T$.

(A) **[Ans]** Both X^TX and XX^T have the same eigenvalues

(B) Both X^TX and XX^T have the same eigenvectors

(C) X, XX^TX and XX^T have the same eigenvalues

(D) **[Ans]** D^2 contains the eigenvalues of X^TX on its diagonal

(E) D contains the eigenvalues of X^TX on its diagonal

(F) None of these

Consider X to be a square matrix of size $n \times n$ and $X = UDV^T$.

(A) **[Ans]** If rank(X) $= n$, D has all non-zero entries in diagonal.

(B) If rank(X) $= k$, D has k zeros in diagonal

(C) **[Ans]** If rank(X) $= k$, D has $n - k$ zeros in diagonal

(D) **[Ans]** if rank(X) $= n$ but $|A|$ is a very small number then, D takes the form $D = diag(d_1, d_2, .., \epsilon)$ where ϵ is a very small number

(E) None of these

Suppose you want to apply PCA to your data X which is in 2D and you decompose X as UDV^T. Then,

(A) PCA can be useful if all elements of D are equal

(B) **[Ans]** PCA can be useful if all elements of D are not equal

(C) **[Ans]** D is not full-rank if all points in X lie on a straight line

(D) V is not full-rank if all points in X lie on a straight line

(E) D is not full-rank if all points in X lie on a circle

(F) None of these