ASSIGNMENT-6
PAPOULLIS PROBLEM

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QUESTION

Show that if R is the correlation matrix of the random vector X : $[x_1......, x_n]$ and R^{-1} is its inverse, then $E[X R^{-1} X^t] = n$

SOLUTION

If $R^{-1} = \begin{bmatrix} a_{11}.....a_{1n} \\ a_{n1}.....a_{nn} \end{bmatrix}$ then $\sum_j a_{ij} R_{ji} = 1$

Hence, $E[XR^{-1}X^t] = E[\sum\limits_{n}^{i=1} \sum\limits_{n}^{j=1} x_i a_{ij} x_j]$

$= \sum\limits_{n}^{i=1} \sum\limits_{n}^{j=1} a_{ij} R_{ji}$

$= \sum\limits_{i=1}^{n} 1 = n$

$\boxed{\therefore E[XR^{-1}X^t] = n}$