AI1103-Challenging Problem 1

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Latex codes :

https://github.com/CS20BTECH11004/AI1103/blob
/main/Challenging%20Problem%201/
Challenging%20Problem%201.tex

QUESTION: CHALLENGING PROBLEM 1

Let X be a random variable such that $E(X) = E(X^2) = 1$. Then $E(X^{100}) =$?

(A) 0

(B) 1

(C) 2^{100}

(D) $2^{100} + 1$

SOLUTION

$$\rho^2 = E[X^2] - E[X]^2 \qquad (0.0.1)$$
$$= 1 - 1^2 \qquad (0.0.2)$$
$$= 0 \qquad (0.0.3)$$

$\therefore$ X is constant and equal to 1
Thus we can conclude that

$$E[X^{100}] = \sum X \Pr(X) \qquad (0.0.4)$$
$$= 1 \qquad (0.0.5)$$

Solution: Option B