Assignment 2

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GATE- PROBLEM NO.3

The probability that a k-digit number does NOT contain the digits 0, 5 or 9 is

A) $(0.3)^k$
B) $(0.6)^k$
C) $(0.7)^k$
D) $(0.9)^k$

SOLUTION

Let

$$X_i \in \{0, 1, 2, \ldots, 9\} \tag{0.0.1}$$

represent the digit at the ith place.

$$\Pr(X_i \notin \{0, 5, 9\}) = \frac{7}{10} = 0.7 \tag{0.0.2}$$

If the k-digit number does not contain 0,5 or 9,

$$\Pr(X_1 \notin \{0, 5, 9\}, X_2 \notin \{0, 5, 9\}, \ldots, X_k \neq \{0, 5, 9\}) \tag{0.0.3}$$

Since the events are independent,

$$\Pr(X_1 \notin \{0, 5, 9\}, X_2 \notin \{0, 5, 9\}, \ldots, X_k \neq \{0, 5, 9\})$$
$$= \Pr(X_1 \notin \{0, 5, 9\}) \ldots \Pr(X_k \notin \{0, 5, 9\}) \tag{0.0.4}$$

$$= \prod_{i=1}^{k} 0.7 \tag{0.0.5}$$

$$= (0.7)^k \tag{0.0.6}$$