

# GATE

January 8, 2024

1. A counter is constructed with three  $D$  flip-flops. The input-output pairs are named  $(D_0, Q_0)$ ,  $(D_1, Q_1)$ , and  $(D_2, Q_2)$ , where the subscript 0 denotes the least significant bit. The output sequence is desired to be the Gray-code sequence 000, 001, 011, 010, 110, 111, 101, and 100, repeating periodically. Note that the bits are listed in the  $Q_2 Q_1 Q_0$  format. The combinational logic expression for  $D_1$  is

(a)  $Q_2 Q_1 Q_0$

(b)  $Q_2 Q_0 + Q_1 \bar{Q}_0$

(c)  $\bar{Q}_2 Q_0 + Q_1 \bar{Q}_0$

(d)  $Q_2 Q_1 + \bar{Q}_2 \bar{Q}_1$