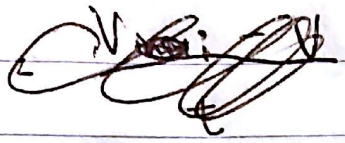
2. a) $Q_{bit} = V_{bit} C_{bit}$

$$I_{leak} = \frac{dV_{bit}}{dt} C_{bit}$$

constant leakage



$$= \frac{\Delta V_{bit}}{\Delta t} C_{bit}$$

$$\frac{(1.2V - 0.8V) \times 18}{10^{-3}} = 7.2$$

b) $$C = \frac{\varepsilon A}{d} = \frac{\varepsilon\, 1024 (0.5 \times 10^{-6})(0.5 \times 10^{-6})}{0.1 \times 10^{-6}}$$

$$= 22.7$$

c) $$C_{bit} V_{bit} = (C_{bit} + C_{wire}) V_{column}$$

$$\frac{C_{bit}}{(C_{bit} + C_{wire})} V_{bit} = V_{column}$$

$$\frac{18}{36} V_{bit} = V_{column}$$

$$= 0\,V \quad \text{or} \quad 0.57\,V$$

d) $$\frac{18}{18 + C_{max}} \cdot 1.2 \approx 0.4$$

$$\frac{1.2}{0.4} 18 - 18 = 36$$

$$36 \times 10^{-15} = \frac{\varepsilon n (0.5 \times 10^{-6})(0.5 \times 10^{-6})}{0.1 \times 10^{-6}}$$

$$\frac{36 \times 10^{-9}}{25\,\varepsilon} = n \quad = 1626$$