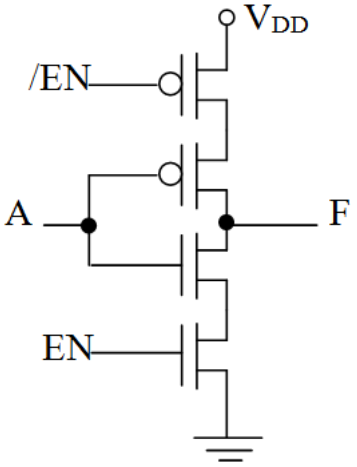
UNIT 4. CMOS

3.1. The CMOS circuit of figure is:



EN = 1 ⇒ /EN = 0 ⇒ F = $\bar{A}$
EN = 0 ⇒ /EN = 1 ⇒ F = "Z"

A) An inverter
B) A tri-state inverter
C) A tri-state buffer
D) An open-drain buffer

UNIT 4. CMOS

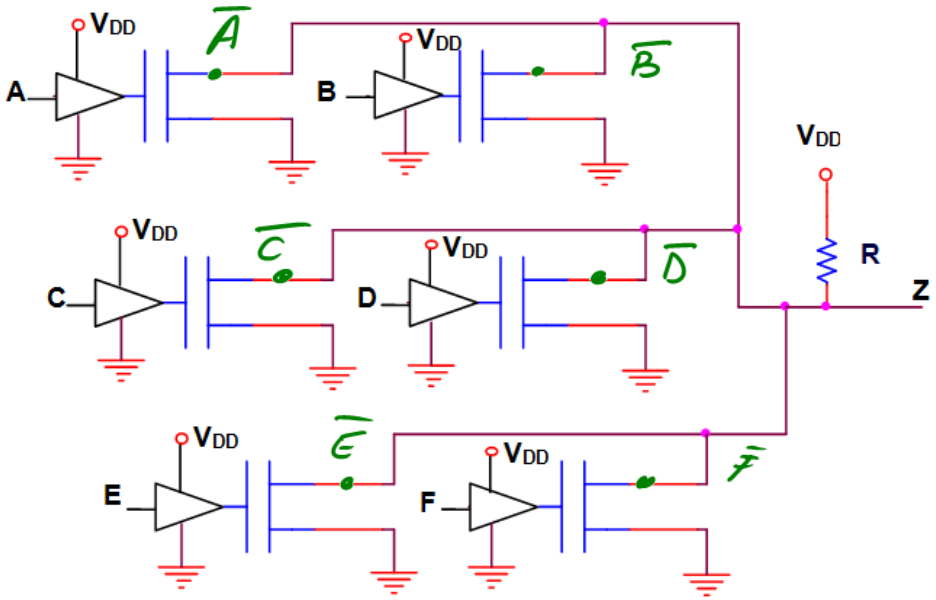
3.2. Indicate the logical expression of the wired function Z. The gates have an open-drain output. Suppose that R is a pull-up resistor of appropriate value.

[A] $Z = A + B + C + D + E + F$

[B] $Z = \overline{A + B + C + D + E + F}$

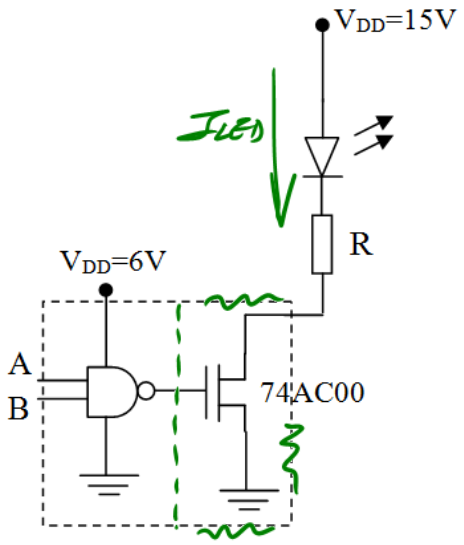
[C] $Z = (A + B).(C + D).(E + F)$

[D] $Z = A.B.C.D.E.F$



$Z = \overline{A} \cdot \overline{B} \cdot \overline{C} \cdot \overline{D} \cdot \overline{E} \cdot \overline{F} = \overline{\overline{A} \cdot \overline{B} \cdot \overline{C} \cdot \overline{D} \cdot \overline{E} \cdot \overline{F}} = A + B + C + D + E + F$

3.3. The following Figure shows the control circuit of a LED with a NAND gate with open-drain output. 74AC gates have been used for this purpose, as they provide enough current to the LED (74HC gates have a maximum output current of only 4 mA). Design the appropriate value of resistor R so that the LED lights properly.



Data of 74AC00
I_{OLmax} = 24 mA
V_{OLmax} = 0.37V

Data of LED
I_{LED} = 10 mA
V_{LED} = 1.6V

$I_{LED} = 10mA.$

$$R = \frac{V_{DD} - V_{OLmax} - V_{LED}}{I_{LED}}$$

$$R = \frac{15 - 0.37 - 1.6}{10} = 1.3\,K$$

A) R = 130Ω
B) R = 3k3
C) R = 1.3KΩ
D) None of the previous answers is correct