CSE460 Assignment 1 - Complete Detailed Solutions

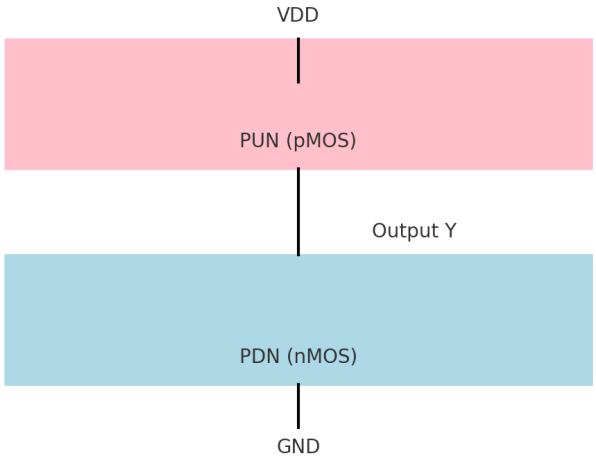
Question 1: CMOS Implementation

(a) Y = ((A.B.C) + D).E:

- Pull-down network: (A, B, C in series) parallel with D, all in series with E.
- Pull-up network: complement of pull-down (parallel ABC, series D, parallel E).

(b) Y = (A+(B.C)).(D+E):

- Pull-down network: (A parallel BC series) in series with (D parallel E).
- Pull-up network: Complement of pull-down network.



Question 3: Pass Transistor Circuits

Output voltage determined by transistor type:

- nMOS transistor passes strong '0', degraded '1' (max = VDD - Vtn).
- pMOS transistor passes strong '1', degraded '0' (min = |Vtp|).

Apply this logic to each transistor circuit given.

Questions 4 & 7: Voltage Calculation

Use MOSFET voltage rules:

- For nMOS transistor passing '1': Output = Vg - Vtn.
- For pMOS transistor passing '0': Output = Vg + |Vtp|.

Compute node voltages step-by-step using transistor threshold voltages.

Question 5: 8-to-1 MUX Construction

(a) Only 2-to-1 MUX: Use 7 (2-to-1) MUX in three layers.

(b) Only 4-to-1 MUX: Two (4-to-1) MUX, outputs combined with one (2-to-1) MUX.

(c) Combination: One (4-to-1) MUX followed by two (2-to-1) MUXes.