Questions of equal value.
No aids.
50 minutes
If you think anything is ambiguous, state a consistent assumption and continue.

1. Give a circuit that turns on a LED only when two switches are in the same state. Use only OR gates, AND gates and inverters for the logic portion of your circuit.

2. Give a SOP Boolean equation for the output, X, of the following circuit.
3. An inverter has its output connected to its input. The inverter has $T_{th} = 2$ ns. and $T_{lh} = 5$ns. Draw the waveform of the output and give the frequency of oscillation.

4. Convert the following equation to maxterm canonic form.

   \[ X = a \cdot b + a/\cdot c + a/\cdot b/\cdot c \]

5. Use a K map to obtain the simplest POS equation for the following equation.

   \[ X = m0 + m2 + m7 + m8 + m10 + m11 + m14 + m15 \]