1) In section 2, we are going to construct a 4-bit counter using JK flip-flops. Explain clearly why the circuit of section 2 constitutes a 4-bit counter. What should J & K inputs be? What should the "set" and "reset" inputs be?

2) In section 3, we are going to construct a ring oscillator using NAND gates. Explain clearly why the circuit of section 3 constitutes an oscillator. Why do we need to use an odd number of gates? Where must the unused input of each NAND gate be connected? Assuming that each gate introduces a time delay, $t_D$, what is the frequency of the oscillation?
3) In section 4, we are going to construct a monostable vibrator using 74LS221. Please read the datasheet on 74LS221. What capacitor and resistor values, \( R_1, C_1, R_2, C_2 \) can you use such that the circuit will generate two pulses with pulse-widths of 1 ms and 0.3 ms respectively?