1 (a) [5 Points] Consider an inverter circuit similar to the one used in the laboratory, with a threshold voltage of 2.5 V. It operates with a logic high voltage of 5V and a logic low voltage of 0V. For the input given below, draw the output of the inverter. Be sure to label voltage levels in your diagram.

![Inverter 1 Diagram](image)

1 (b) [5 Points] Repeat part (a) for a different inverter with a threshold voltage of 4 V. Draw the output of this inverter for the following input signal.

![Inverter 2 Diagram](image)

2. You are working on a system design and your supervisor asks you to build a circuit with the following properties: If the input is below a certain voltage, \( v_l \), the circuit outputs 5V. If the input is above \( v_l \), the circuit outputs -5V. You have to build the circuit using one of the following modules.

- Comparator
- Buffer
- Inverting Amplifier
- Non-inverting Amplifier

a. [5 Points] Which of the above circuit module would be best suited for this task, and why would you use it?

Comparator
- Compares \( v_{in} \) to threshold voltage
- Has two output levels
b. **[5 Points]** Draw the circuit in the space below and be sure to label input, output, circuit power, and the location of $v_1$.

![Circuit Diagram](image)

**3a. [5 Points]** Draw the waveforms of the following circuit at points E, and F when a square wave is applied at point D as shown below. Assume an ideal inverter with a threshold of 2.5V. Label voltage levels in your diagram.

![Waveform Diagram](image)

**3b. [5 Points]** Draw the timing diagram for circuit shown below. Use the same assumption as in 3a and be sure to label voltage levels in your diagram.

![Timing Diagram](image)
4. [10 Points] Draw a timing diagram for the circuit below with the initial voltage levels as indicated on the diagram. Be sure to label voltage levels and include at least one full cycle in your diagram.