

University Electrical Engineering

Name: _____ Score: _____

1. Flash at 0x0000_0000 and SRAM at 0x2000_0000 can overlap if the flash is large enough.
☐ True ☐ False
2. Why must a pointer to a hardware status register be volatile?
☐ The hardware can change the value, so every access must really read it
☐ It makes the code run faster
☐ Registers cannot be read without it
☐ It stops the register changing
3. With memory-mapped I/O, the CPU uses ordinary load and store instructions to talk to a peripheral.
☐ True ☐ False
4. A timer runs from 84 MHz with prescaler 84 and reload 1000. What is the interrupt rate in Hz?
_____ Hz
5. At 115 200 baud, 8N1, one byte takes
☐ 1 ms
☐ 86.8 μ s (10 bit times)
☐ 8.68 μ s
☐ 69.4 μ s (8 bit times)
6. An 8-bit ADC uses a 3.3 V reference. What is one LSB, in mV? Give 1 decimal place.
_____ mV
7. Bisection searches 512 suspect instructions. How many probes does it need at most?

8. 8 KB of SRAM needs how many address lines?
☐ 8192
☐ 13
☐ 8
☐ 16
9. Each line of assembly corresponds to one machine instruction.

☐ True ☐ False

10. A pin stays an input no matter what you write to its data register. The likely cause is

- ☐ Its direction-register bit was never set to output
- ☐ The clock is too slow
- ☐ volatile is missing
- ☐ The data register is broken

1. False

The regions differ in their top address bits, so no address can belong to both; the decoder separates them by those bits.

2. The hardware can change the value, so every access must really read it

Without ‘volatile’ the compiler may read once and reuse the value, so a loop waiting for a status bit can spin for ever.

3. True

The peripheral’s registers sit at addresses, so a read or write to that address reaches the hardware instead of RAM.

4. 1000 Hz

$84 \times 10^6 / (84 \times 1000) = 1000$ Hz: a 1 ms tick, with both factors inside 16 bits.

5. 86.8 μ s (10 bit times)

8N1 is 10 bits per byte, and $10/115\,200 = 86.8$ μ s. The start and stop bits are part of the price.

6. 12.9 mV

$3.3/2^8 = 3.3/256 = 12.9$ mV. Each extra bit halves the step.

7. 9

Each probe halves the range: $\log_2 512 = 9$.

8. 13

8 KB = $8192 = 2^{13}$ bytes, so 13 lines; it spans ‘0x2000_0000’ to ‘0x2000_1FFF’.

9. True

That is what makes assembly useful for checking compiler output; one C line often becomes several instructions.

10. Its direction-register bit was never set to output

The direction register decides which way the pin works; the data register only carries the level. Set the direction first.