G. Kovacs Quals Question 2005

The student is told about self-flashing LED's, which are explained using a block diagram. The LED consists of a standard LED light emitting chip and a CMOS chip that generates a squarewave of current through the LED alternating between zero and twenty milliamps. The student is then asked to think about 100 of the same blinking LEDs wired in parallel, with the total current from all 100 flowing to ground through a 0.1 Ohm resistor. The student is asked to sketch the voltage waveform at the node between the resistor and the negative terminals of the blinking LEDs from time zero to a minute or so.

The student is then shown the actual waveform from the circuit. They are asked to compare to their sketch and explain any differences.

The student is then asked to consider the power spectrum of the signal presented to them over a minute or so. The emphasis is not on minute detail, but understanding how large-scale changes in the waveform over this time would manifest in changes in the power spectrum.

The student is then shown the actual power spectrum and asked to compare their sketch or comments to it and comment.