userid: _____

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Opamps are available with the following data sheet values:

V_{OS}	I_B	I_{OS}	R_D	R_C	R_O	f_t	A_o	I_{sc}	L_+	L_-
1 mV	1 μA	1 nA	1 MΩ	1 GΩ	75 Ω	1 MHz	200 k	10 mA	+ 14 V	- 14 V

where I_{sc} is the maximum current the opamp's output can supply.

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5% PVNS (Preferred Value Numbering Systems) list: 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91.

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(1)   for $v(t) = V_o\, e^{st}$, supply an expression for the impedance of a capacitor.

(2)   for $v(t) = V_p \cos(\omega t)$, supply an expression for the impedance of an inductor.

(3)   for $v(t) = V_p \cos(\omega t)$, what expression is in common to all waveforms for a single tone linear network?

(4)   From a measurement precision point of view, what range of values does each of the following measurements represent?
       (a) 2 MΩ
       (b) 2.0 MΩ
       (c) 2.00 MΩ
       (d) 2.000 MΩ

(5)   In the following, you have available 5% resistors and capacitors, a ± 15 V power supply, as well as, two general purpose opamps. You will need to supply a circuit with $v_o = (v_1 + 2 v_2 + 3 v_3) - (v_4 + 2 v_5 + 3 v_6)$ (assuming all inputs are from 50 Ω sensor).