F2018 MTE220 Assignment 7

userid: _____

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_-	SR
1 μV	1 μA	1 pA	1 MΩ	1 GΩ	75 Ω	1 MHz	200 k	10 mA	+ 14 V	- 14 V	0.5 V/μs

where: I_{sc} is maximum current opamp can supply and SR is maximum time rate of change of opamp's output voltage

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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.

1% PVNS (Preferred Value Numbering Systems) list: 100, 102, 105, 107, 110, 113, 115, 118, 121, 124, 127, 130, 133, 137, 140, 143, 147, 150, 154, 158, 162, 165, 169, 174, 178, 182, 187, 191, 196, 200, 205, 210, 215, 221, 226, 232, 237, 243, 249, 255, 261, 267, 274, 280, 287, 294, 301, 309, 316, 324, 332, 340, 348, 357, 365, 374, 383, 392, 402, 412, 422, 432, 442, 453, 464, 475, 487, 499, 511, 523, 536, 549, 562, 576, 590, 604, 619, 634, 649, 665, 681, 698, 715, 732, 750, 768, 787, 806, 825, 845, 866, 887, 909, 931, 953, 976.

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(1) Design a single opamp inverting amplifier with a voltage gain of -100. For this amplifier, supply the small-signal input resistance, small-signal output resistance, and the small-signal -3dB bandwidth.

(2) Design a single opamp non-inverting amplifier with a voltage gain of +100. For this amplifier, supply the small-signal input resistance, small-signal output resistance, and the small-signal -3dB bandwidth.

(3) Design a single opamp difference amplifier with a voltage gain of 100. For this amplifier, supply the small-signal input resistances, small-signal output resistance, and the small-signal -3dB bandwidth.

(4) Design an instrumentation amplifier with a voltage gain of 100. For this amplifier, supply the small-signal input resistances, small-signal output resistance, and the small-signal -3dB bandwidth.