NANYANG TECHNOLOGICAL UNIVERSITY
SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING
EE4341 ADVANCED ANALOG CIRCUITS
TUTORIAL 1

1. Determine the thermal noise voltage of a 50 kΩ resistor at room temperature of 290K for each of the following bandwidths: 50 kHz, 1 MHz, and 20 MHz. There is no dc bias applied to the resistor. Boltzmann's constant k = 1.38×10^{-23} J/K.

2. For an equivalent noise bandwidth of 10 MHz, determine the resultant rms thermal noise voltage between points "x" and "y" shown in Fig. 1. No dc voltage is applied to the circuit. The noises generated by the two resistors are uncorrelated. Boltzmann's constant k = 1.38×10^{-23} J/K and T = 300K.

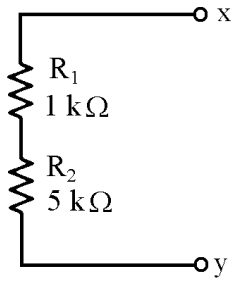

Fig. 1

3. Derive the expression of the -3dB bandwidth and equivalent noise bandwidth of Fig. 2.

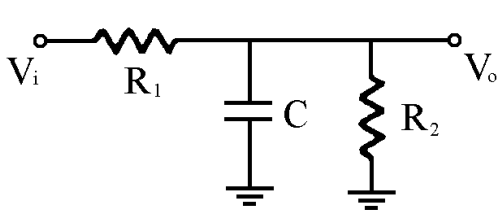

Fig.2

4. A 100 kΩ resistor has a noise index (NI) of 5 μV/V. Derive a general expression for excess noise voltage over an arbitrary frequency range from f_1 to f_2 (Hz) in terms of NI. If the DC voltage across the resistor is 5 V, what is the total rms noise voltage generated by this resistor between 20 Hz and 200 kHz? Boltzmann's constant k = 1.38×10^{-23} J/K and T = 300K.