| SANTA CLARA UNIVERSITY | ELEN 115 – Spring 2023 | S. Krishnan |
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| **Homework #4 –Amplifiers** | | |

1. A designer has to connect a 100μA peak sinusoidal current source $i_s$ and a source resistance $R_s$ =10kΩ to a load resistance $R_L$ = 5kΩ. The voltage across the load $R_L$ is $v_o$ **and** the output current through $R_L$ is $i_o$.

She considers alternatives for maximizing gain from the signal source to the load by using an amplifier with gain 50mV/μA and input resistance $R_i$ and output resistance $R_o$

(a) Draw the schematic clearly showing the source, amplifier and the load.

She has a choice of four amplifiers:

1. Gain = 50mV/μA, input resistance $R_i$ = 10kΩ and output resistance $R_o$ = 5kΩ.
2. Gain = 50mV/μA, input resistance $R_i$ = 100Ω and output resistance $R_o$ = 50Ω.
3. Gain = 50mV/μA, input resistance $R_i$ = 10kΩ and output resistance $R_o$ = 50Ω.
4. Gain = 50mV/μA, input resistance $R_i$ = 100Ω and output resistance $R_o$ = 5kΩ.

(b) Which amplifier option should the designer choose to obtain maximum output? **Explain your choice clearly using your fundamental understanding of amplifiers.** ***Do not work the numbers out for each choice.***

(c) For the choice made in (b) what is the power delivered to the load?

2. A particular amplifier operating from a dual supply of **± 10V** exhibits clipped peaks for output signals that extend above 8V and below -9V. The gain of the amplifer is 2V/V.
   (i) When this amplifier is biased at 0V
      a. What is the peak value of the largest possible undistorted sine wave at the output ?
      b. What is the peak value of the corresponding sine wave at the input ?
   (ii) At what bias point and input voltage can we get the maximum possible undistorted sine wave output ?

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