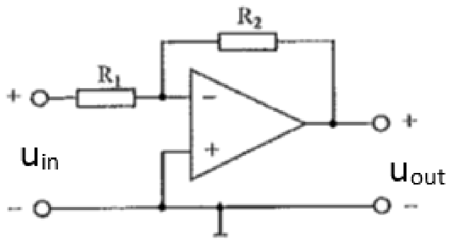
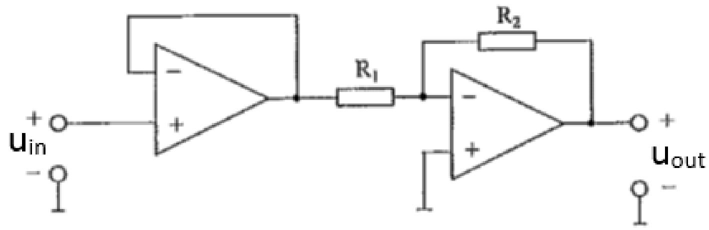
Amplifier circuits exercises for SSY091 – Biomedical Instrumentation

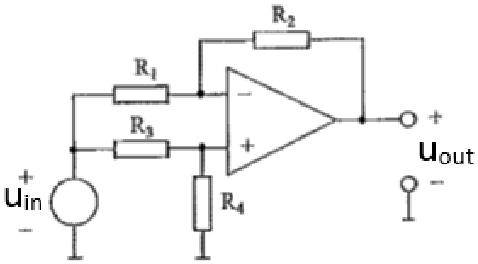
1. Calculate transfer function u_{out}/u_{in}, input and output impedance for the following circuit. Assume ideal operational amplifier. R1 = 1 kΩ, R2 = 10 kΩ.



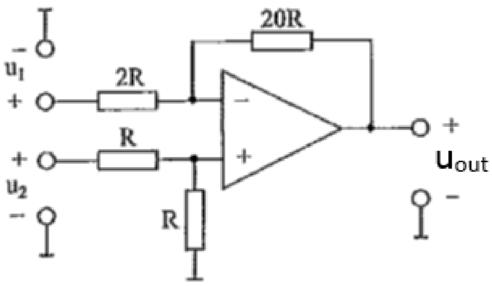
2. Calculate the transfer function u_{out}/u_{in} for the circuit.
   Assume ideal operational amplifiers.



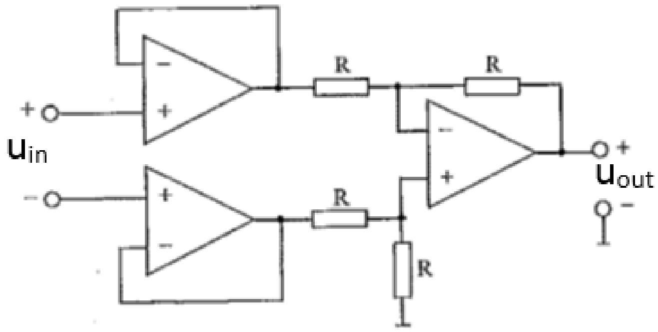
3. Due to a mistake in the coupling, the signal source was connected to both input terminals of the differential amplifier in the circuit below. What is the amplification u_{out}/u_{in} in this case? How does the amplification change with increasing value of R4 (R4 → ∞) ?
   Assume ideal operational amplifier.



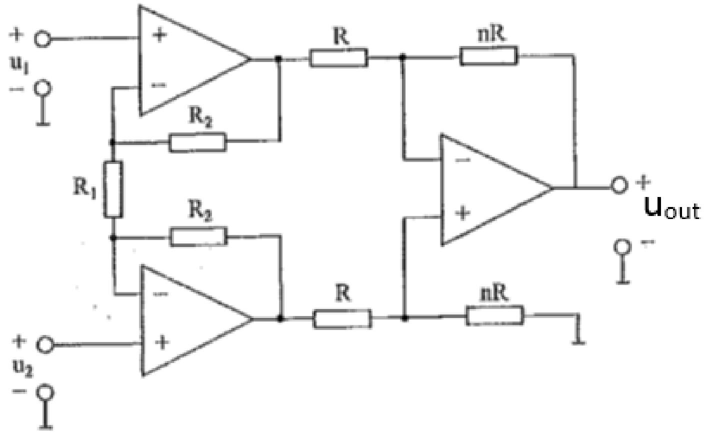
4. The CMRR parameter is an important measurement of an amplifier's ability to amplify the differential signal while rejecting the common signals at the input terminals. Calculate the CMRR for the circuit below.
   Assume ideal operational amplifier.



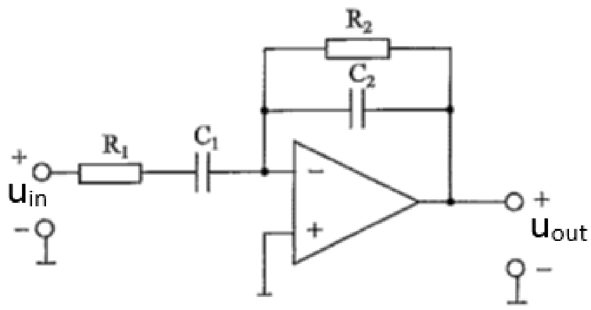
5. Calculate the transfer function u_{out}/u_{in}.
   Assume ideal operational amplifiers.



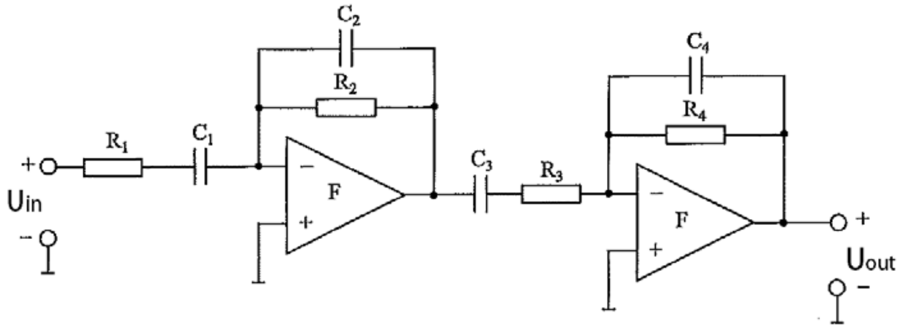
6. Calculate differential mode and common mode amplification for the circuit in the figure below.
   Assume ideal operational amplifiers.
   Hint: u_1 and u_2 can be written in terms of u_{CM} and u_{DM}, representing the common and the differential component of the input signal, respectively. When in common mode, u_1=u_2=u_{CM}; in differential mode u_1=u_{DM}/2 and u2=-u_{DM}/2.



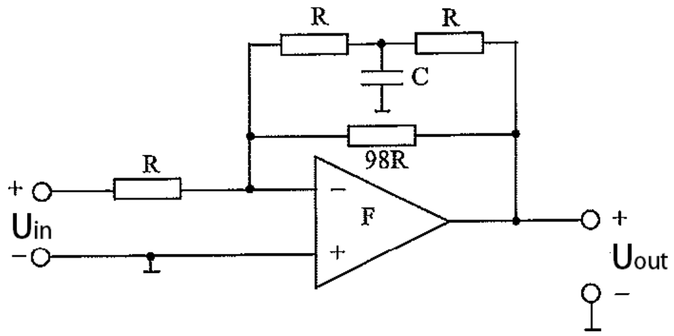
7. Calculate the transfer function u_{out}/u_{in} for an amplifier composed of 3 steps of the circuit in the figure.
   Assume ideal operational amplifiers. R1=5 kΩ, R2=100 kΩ, C1= 2 uF, C2=150 pF.



8. Calculate the transfer function u_{out}/u_{in} for the amplifier in the figure.
   Assume ideal operational amplifiers. R1=5 kΩ, R2=100 kΩ, R3=10 kΩ, R4=100 kΩ, C1=2 uF, C2=150 pF, C3=12.5 uF, C4=15 pF.



9. Calculate the transfer function u_{out}/u_{in} for the amplifier below.
   Assume ideal operational amplifiers. R=10 kΩ, C=10 uF.



10. Calculate the transfer function u_{out}/u_{in} for 3 steps of the filter in the figure.
    Assume ideal operational amplifiers.