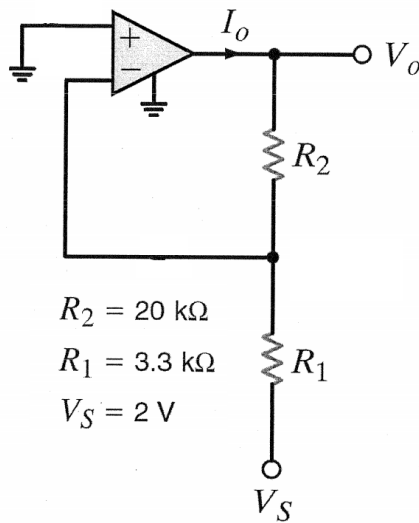1. In the following circuit consisting of an Op-Amp the magnitude of circuit elements are indicated in the following figure. Estimate the output current (Io) and voltage gain. **(2+2)**

$R_2 = 20$ kΩ

$R_1 = 3.3$ kΩ

$V_S = 2$ V

2. Consider the following circuit with an Op-Amp where the maximum Op-Amp o/p current is limited to 100 mA. Estimate the maximum allowable value of R_2 for this circuit configuration and magnitude of Io. **(2+1)**


V_S = 2 V
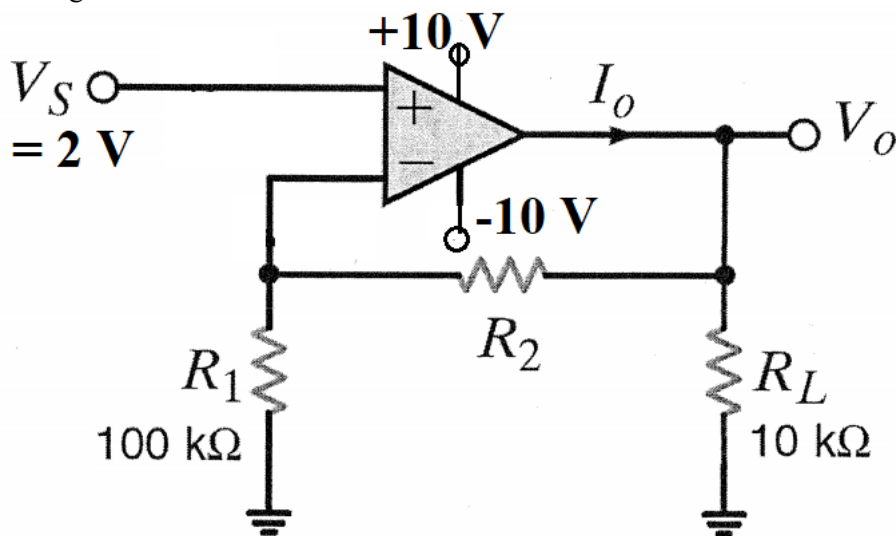
3. For the following circuit the input voltage is V_1. Estimate the voltage gain. **(2)**
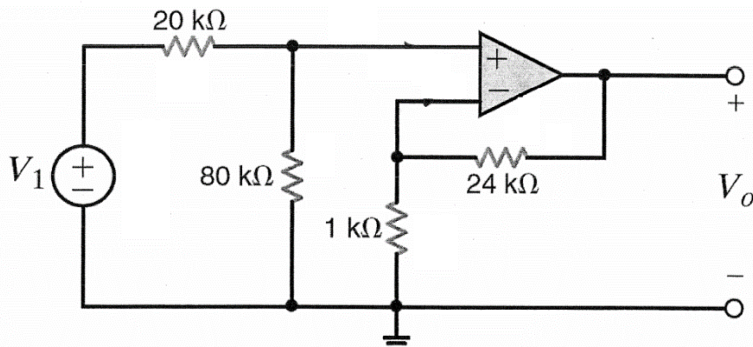
4. The CMRR of a differential amplifier is 50.5 dB. If the differential gain is 52 dB, estimate the common mode voltage gain in dB. **(1)**
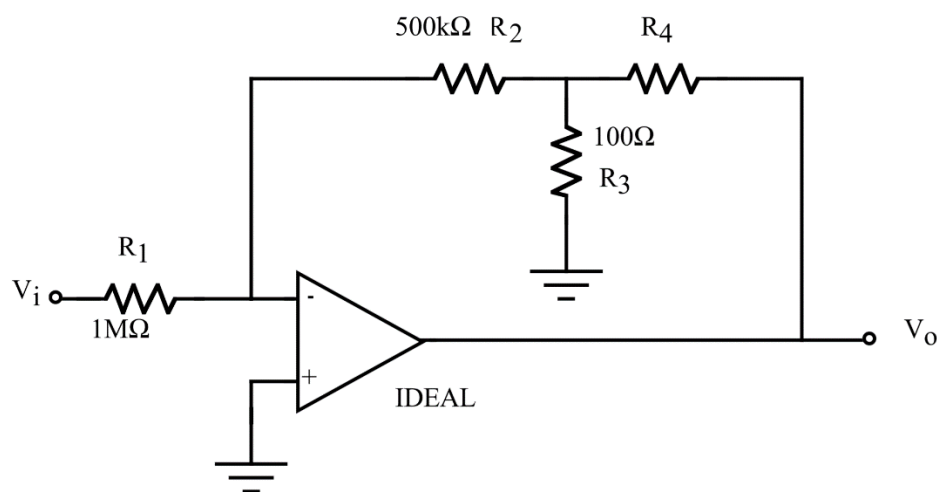
5. You have given three pn junctions of same dimensions and design but made up of different materials: Ge, GaAs and Si. Current at a reverse bias of 2 V will be maximum for _____ pn junction. (name of the material) **(1)**

6. For the following Op-Amp circuit input is a sine wave as shown.
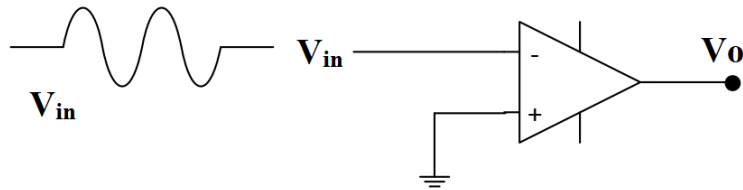
The waveform of Vo will be _____ **(1)**

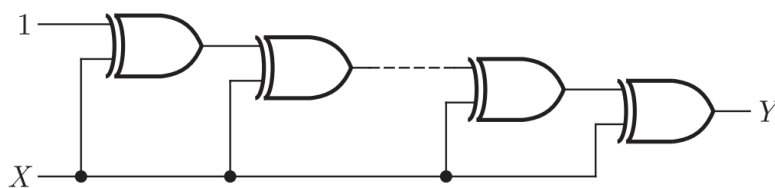7. In the following circuit Op-Amp is ideal. The gain of the circuit is -120.

Estimate the magnitude of R_4. **(3)**

8. Given that: $(12AA)_{16} = (X)_8$ and $(751)_8 = (Y)_{10}$.
   X = _____ and Y = _____ **(2)**

9. Consider the following circuit. The total no. of gate is 20. Find Y. **(2)**

10. Express the following function 'F' in standard sum of product (SOP) form and implement it using basic gates. **(3)**
    $F = \prod(0,1,2,4,5,6,8,9,10)$