Name: _____
SID: _____
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Problem 1 _____ Points of 25
Problem 2 _____ Points of 25
Problem 3 _____ Points of 25
Problem 4 _____ Points of 25
Score _____ %

- Closed book, closed notes
- One pocket calculator permitted (no PDAs, laptops, cell phones, or other electronic devices)
- Show derivations to get partial credit in case of numerical errors
- Cross out incorrect attempts (no partial credit for ambiguous derivations)
- Write results into boxes
- Take off hats or caps and leave backpacks and electronic devices in isle

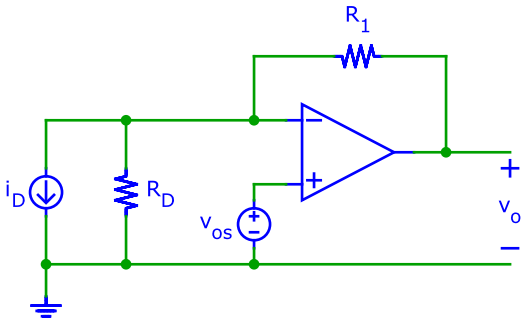
Password: Submit Reload

1. In the circuit below i_D and R_D model a photodiode in a fiberoptic receiver. Find R_1 and v_{os} such that

$$v_o = R_x i_D + v_b \tag{1}$$

Parameter: $R_D =$ kΩ, $R_x =$ kΩ, $v_b =$ mV.

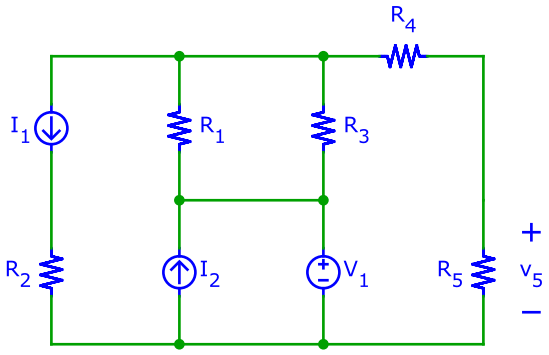
$R_1 =$ 10 pts.
0
$v_{os} =$ 15 pts.
1



2. Find the value of I_1 and R_4 such that the power dissipated in R_2 is $P_{R_2} =$ mW and $v_5 =$ V.
Parameter: $I_2 =$ mA, $V_1 =$ V, $R_1 =$ kΩ, $R_2 =$ kΩ, $R_3 =$ kΩ, $R_5 =$ kΩ.

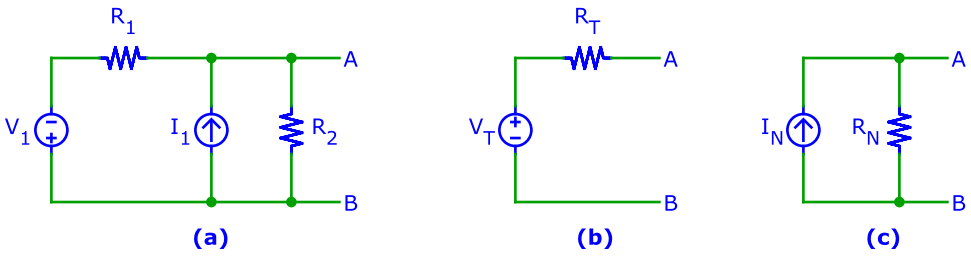
$I_1 =$
$R_4 =$

10 pts.
2
15 pts.
3



3. Find component values such that all three circuits shown behave identically.
   Parameter: $I_1 =$ mA, $V_1 =$ V, $R_1 =$ kΩ and $R_2 =$ kΩ.

$V_T =$		7 pts. 4
$R_T =$		6 pts. 5
$I_N =$		6 pts. 6
$R_N =$		6 pts. 7



4. Precision opamps come particularly close to the specifications of "ideal" amplifiers, but usually cannot drive low resistance loads R_L. In the circuit below, the "precision opamp" sets v_o, while the "power opamp" delivers the load current i_L. Determine R_1 such that $i_o = 0$. Hint: this condition is met when $i_L + i_x = 0$.

   Parameter: $R_2 =$ kΩ, $R_L =$ Ω, $R_x =$ Ω.

   $R_1 =$ [ ] 25 pts. 8