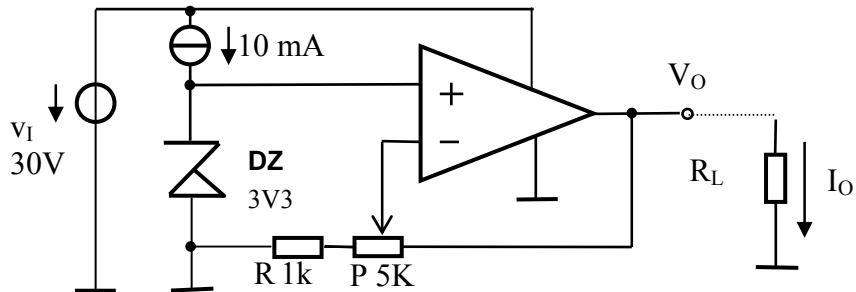# SEMINAR 5

Contents:
- Voltage regulators
- Integrated voltage regulators

1.

a) What is the application of the circuit?
b) At what end should be the tap of the potentiometer to obtain the minimum output voltage? Justify your answer.
b) What is the adjustment range of V_O?

2.

For op amp the maximum output current is $I_{O,OpAmp}=25mA$. Now consider $V_{Ref}=5V$, $v_I=20V$, $P=5K\Omega$, $R_1=12K\Omega$, $R_2=5K\Omega$, $R_3=4K\Omega$ and $R_L=0.75K\Omega$.
a) Find the expression and the possible range of values of v_O depending on the position of the tap of the potentiometer P.
b) Considering R_2 an open-circuit, is the V_O range modified? If yes, recompute the V_O values.
c) Considering R_2 an open-circuit, find the minimum value of the load resistance to maintain the operation of the circuit as voltage regulator.
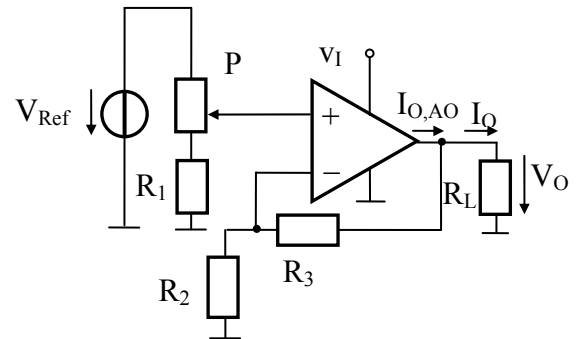
3.

a) What is the application of the circuit? What are the expressions and values of V_{Omax}, V_{Omin} ?
b) How can be modified the circuit so that I_O will be limited to $I_{Omax}=750mA$?
c) Consider the circuit in the previous question ($I_{Omax}=750mA$) and the tap of the potentiometer on the middle position. What is the maximum power dissipated by the transistor T considering $R_L=70\Omega$?
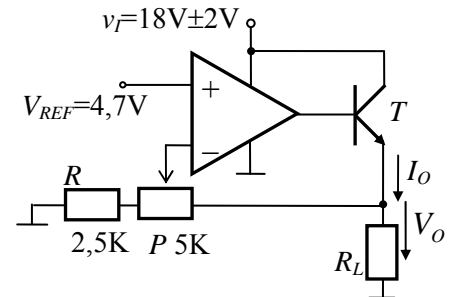
4.

For T_1 and T_2, $V_{BE,on} = 0.6V$

b) Find the expression and the possible range of values of v_O depending on the position of the tap of the potentiometer P.
c) Plot the $v_O(i_O)$ output characteristic of this voltage regulator for the position of the tap of the potentiometer in the lower end, for R_L from ∞ to 0.
d) What components form the short-circuit protection for this voltage regulator? Explain the short-circuit protection mechanism.
e) For $R_L=50\Omega$, compute the maximum power dissipation on T_1.
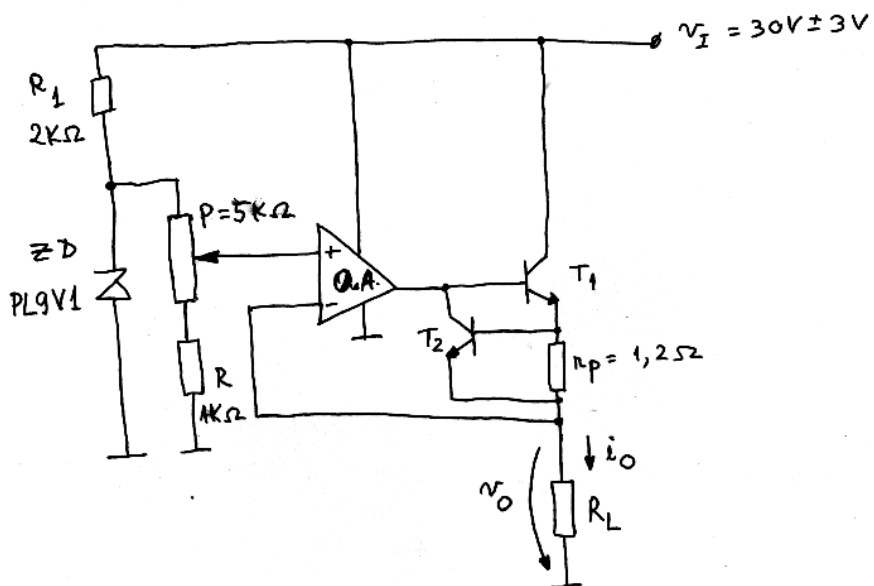
5.

$V_{REF} = 7V$ and $v_I = 14V$ are known.

a) What are the expressions and the values for the minimum and maximum output voltage?

b) What should be the value for the R_p resistance such that the maximum output current is limited at 0,8A?

c) Considering the conditions from b), what is the value of the power dissipated by the T transistor in short-circuit regime?

d)) Considering the conditions from b), what are the values for the output voltage, output current, collector-emitter voltage of the T transistor and the power dissipated by T for $R_L = 3\Omega$?