جامعة بيرزيت

BIRZEIT UNIVERSITY
Electrical Engineering Department
Electronic Circuits 2 – ENEE3304

Voltage Regulators Homework Problems

Problem 1

The base to emitter voltage of the transistor in Fig.(1) is 0.7V . Vi can vary from 12V to 24V.Assume β = 100

a) **What breakdown voltage should the Zener diode have if the load voltage is to be maintained at 9V.**
b) **If the Zener diode must conduct at least 10mA of reverse current to remain in the breakdown , what maximum value should R have?**
c) **With the value of R found in (b) , what is the maximum power dissipated in the Zener diode.**

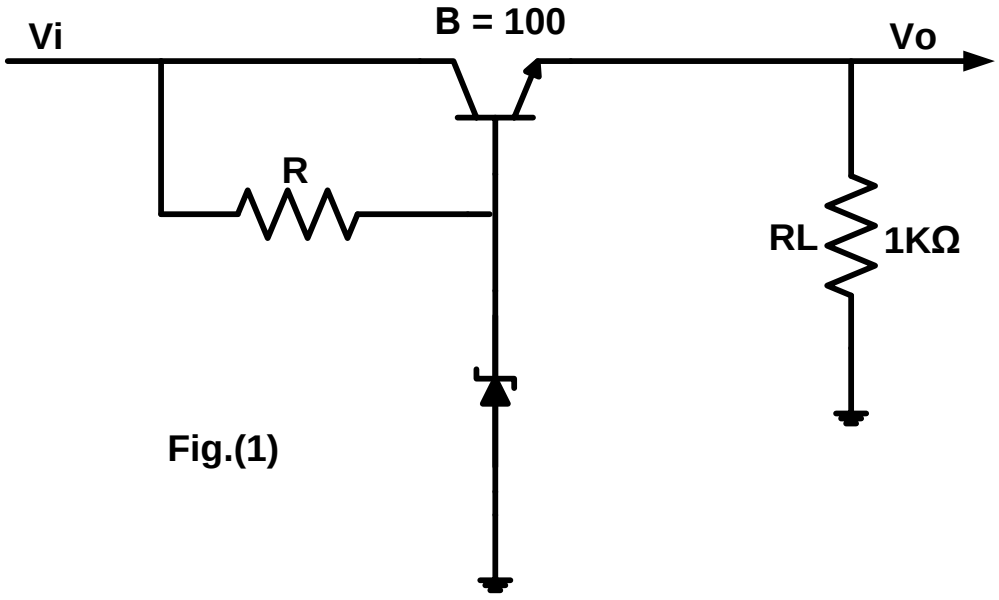

Fig.(1)

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Problem 2

Complete the design of the series voltage regulator shown in Fig.(2) using a 6-V Zener diode to maintain a regulated output voltage of 18V.Asssume that the unregulated input varies between 20V and 30V and the current through the Zener diode must be at least 20mA to keep it in its breakdown region .

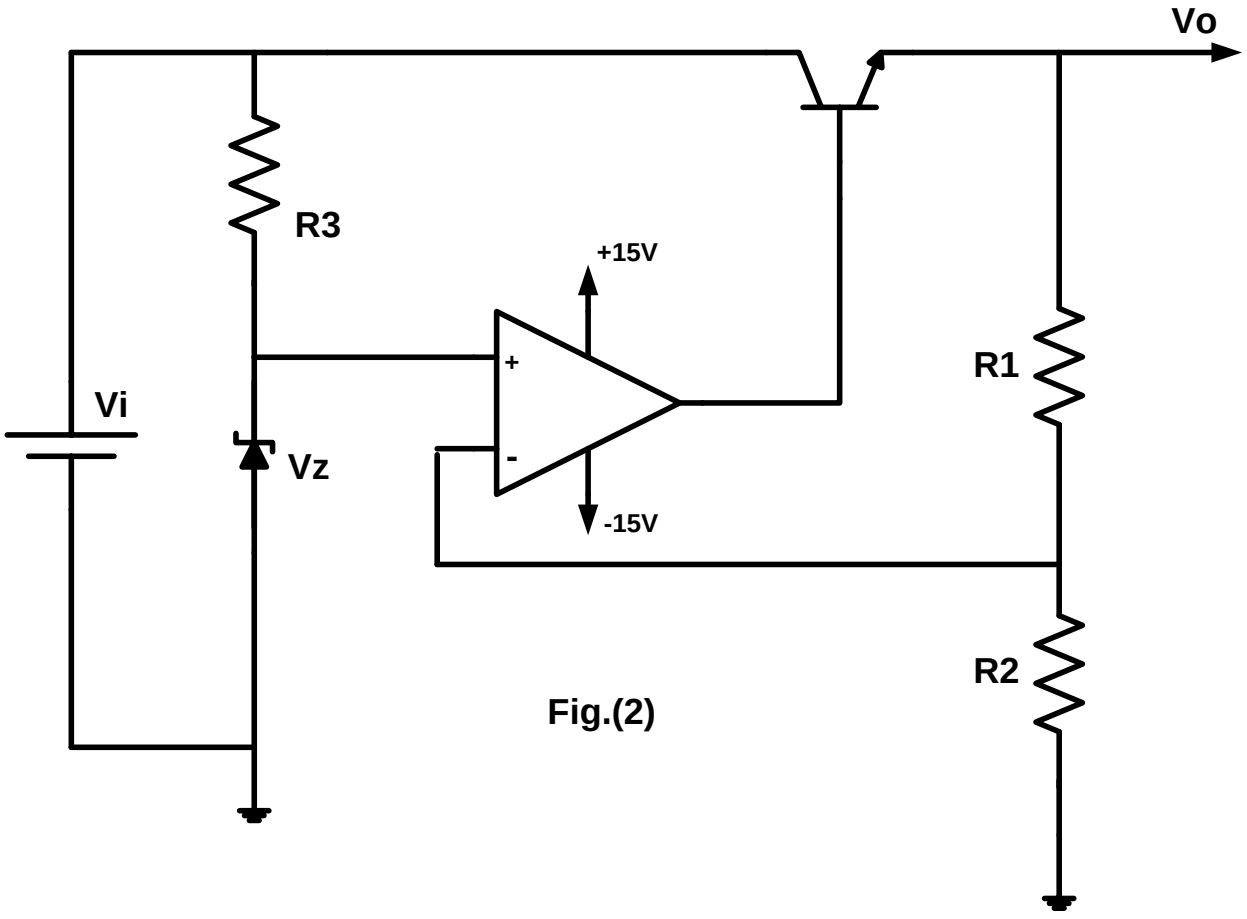

Fig.(2)

Problem 3

The voltage regulator in Fig.(3) is designed to maintain an output voltage of 25V.

a) What value of Rsc should be used if it is desired to limit the maximum load current to 0.5A.

b) With the value of Rsc found in (a), what will be the output voltage when RL = 100Ω.

c) Repeat (b) for RL = 10Ω.

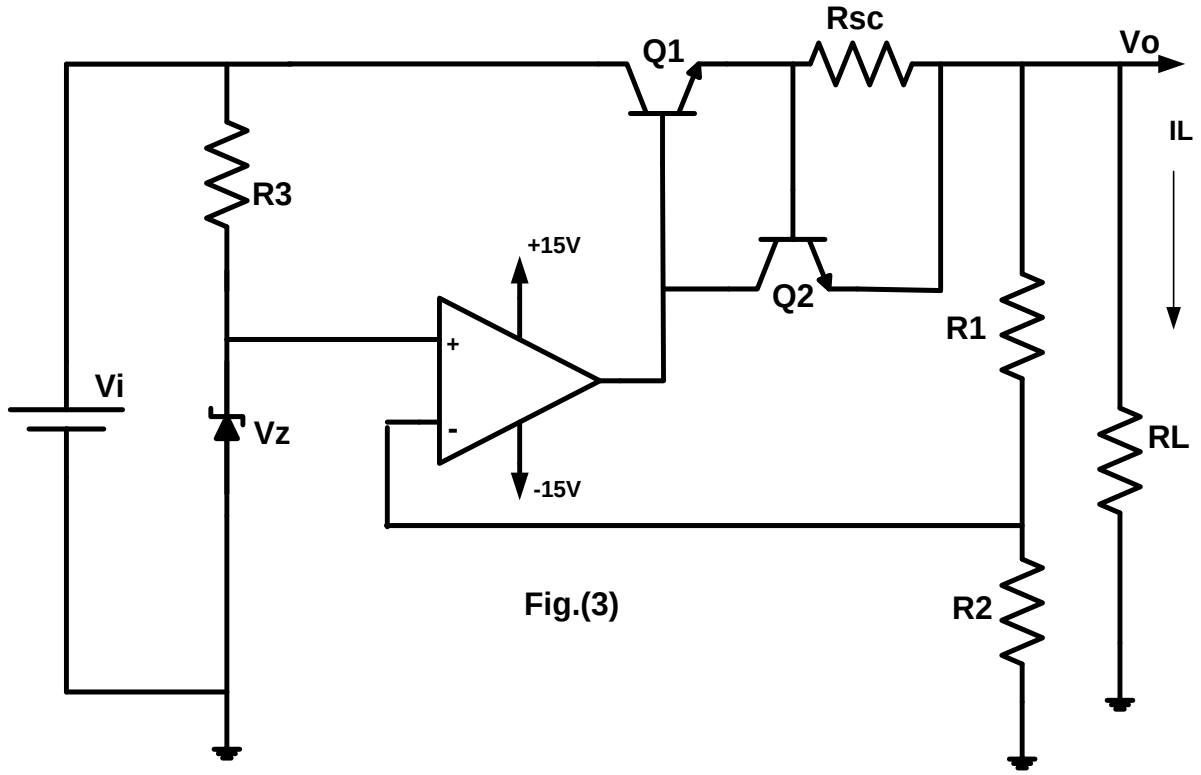

Fig.(3)

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Problem 4

For the voltage regulator shown in Fig.(5)

a) **Determine the minimum and the maximum value of the output voltage assuming that I_Q = 10mA.**

b) **Assume that R2 has been adjusted to 100Ω , but I_Q has changed to 7mA . Recompute Vo.**

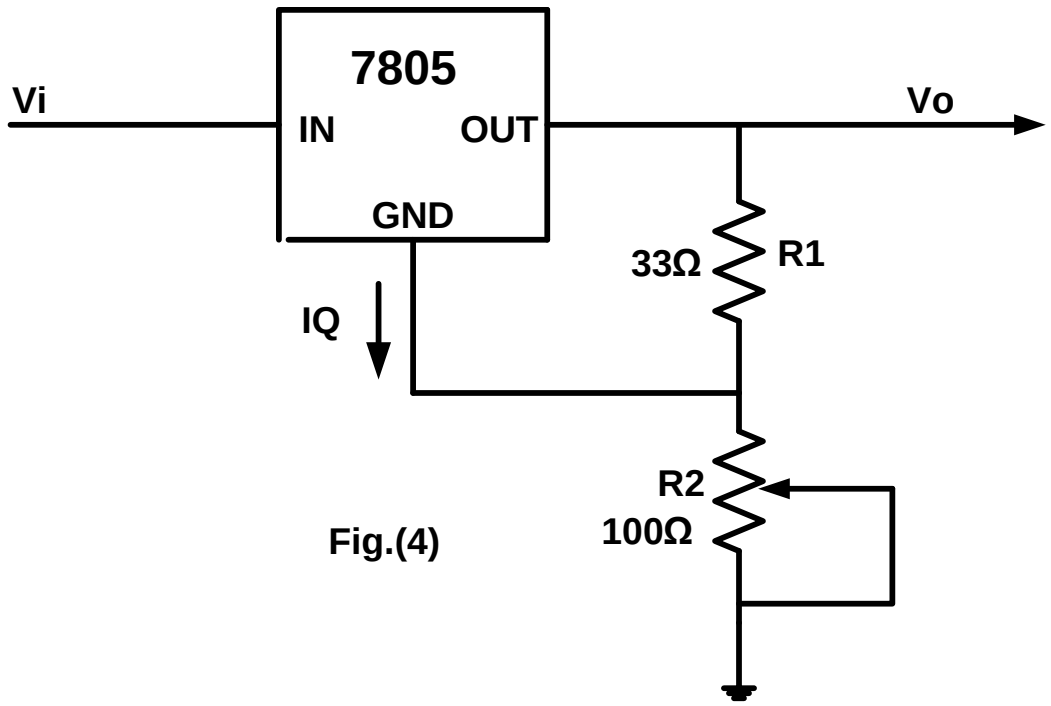

Fig.(4)

Problem 5

For the dual polarity voltage regulator shown in Fig.(5) .

a) **Determine the positive and the negative load voltages produced by the circuit shown in Fig,(5) if R2A = R2B = 10KΩ.**

b) **Repeat part (a) if R2A=0Ω and R2B = 20KΩ.**

c) **Repeat part (a) if R2A = 20KΩ and R2B = 0Ω.**

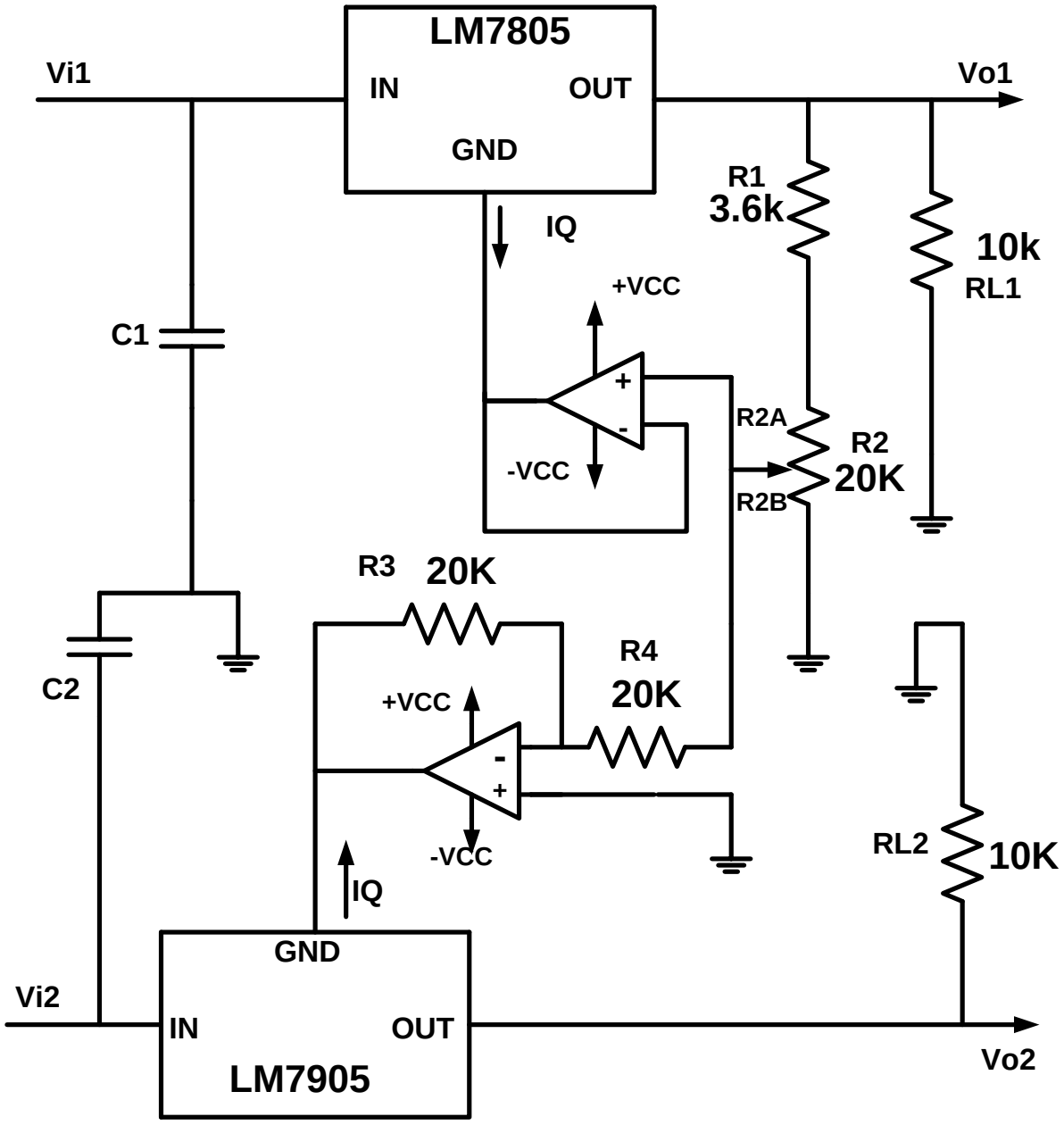

Fig.(5)