8 Zener diode

1) Task

In the circuit of Fig.1, determine the operating point of the Zener diode. For calculations, assume E = 18V, R_L = 1k, R_S = 1k, and a Zener diode with parameters: V_Z = 6V3, R_Z = 0, I_{Zmin} = 3mA.

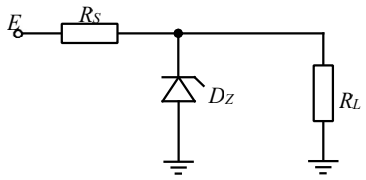

Fig.1.

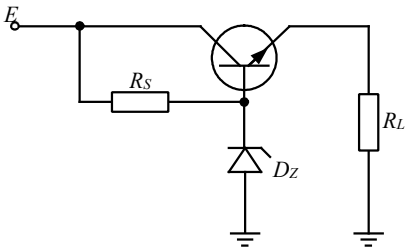

Fig.2.

2) Task

What is the maximum current (I_L) drawn from the stabilizer with Zener diode from Fig.1. For the calculation, assume E = 15V, R_S = k33 and Zener diode with parameters: V_Z = 5V6, R_Z = 0, I_{Zmin} = 5mA.

3) Task

What power is emitted in the Zener diode in the circuit of Fig.1. For the calculation assume E = 18V, R_L = 2k, R_S = k33 and Zener diode with parameters: V_Z = 6V8, R_Z = 0, I_{Zmin} = 3mA.

4) Task

What is the minimum current I_L drawn from the stabilizer in Fig.1, at which power less than 0.1W will be given off in the Zener diode. For the calculation, assume E = 20V, R_S = k51 and a diode with V_Z = 5V1.

5) Task

Calculate the range of variation of the input voltage E for a stabilizer with a Zener diode Fig.1. For the calculation, assume R_L = 2k, R_S = k51 and a Zener diode with parameters: V_Z = 6V8, R_Z = 0, I_{Zmin} = 3mA, P_Z = 0.5W.

6) Task

Calculate the coefficient of stabilization of the output voltage from the input voltage E for a stabilizer with a Zener diode Fig.1. For the calculation assume E = 15V, R_L = 2k, R_S = 630 and a Zener diode with parameters: V_Z = 6V8, R_Z = 40, I_{Zmin} = 3mA.

7) Task

How the output voltage in the stabilizer in Fig.1 will change with changes in the input voltage E from

15V to 10V. For calculations, assume R_L = 1k, R_S = k68 and a Zener diode with parameters: V_Z = 3V3, R_Z = 50, I_{Zmin} = 3mA.

8) Task

How will the output voltage change in the stabilizer in Fig.1 with changes in load current (I_L) from 2 to

3mA. For calculations, assume R_S = 1k, E = 18 V and a Zener diode with parameters: V_Z = 7V5, R_Z = 40, I_{Zmin} = 3mA.

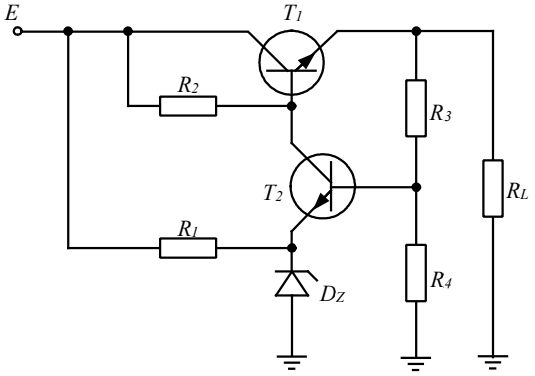

Fig.3.

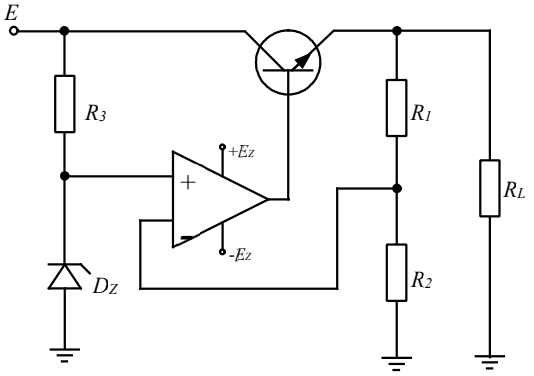

Fig.4.

9) Task

In the stabilizer circuit of Fig.2 with the assumptions that E = 25V, R_S 1k, R_L = 20, V_Z = 7V5, $R_{(Z)}$0,

I_{Zmin} = 3mA and U_{BE} = 0.65V, β = 100, calculate:

a) Voltage and current at the output of the stabilizer,
b) Zener diode operating point,
c) transistor operating point,
d) The power dissipated in the transistor.

10) Task

How the output voltage in the stabilizer in Fig.2 will change with changes in the input voltage E from

10V to 15V. For calculations, assume R_L = 0k5, R_S = 1k, V_Z = 4V6, R_Z = 10, I_{Zmin} = 3mA and U_{BE} = 0.7V, β = 180. Calculate the voltage stabilization factor.

11) Task

In the stabilizer circuit of Fig.3 with the assumptions that E = 15V, R_1 = 1k, R_2 = 2k, R_3 = 1k, R_4 = 3k, R_L 40,

V_Z = 6V2, R_Z = 0, I_{Zmin} = 3mA and U_{BE} = 0.7V, β = 180, calculate:

a) output voltage of the stabilizer,
b) power released at T1.

12) Task

In the stabilizer circuit of Fig.4 with the assumptions that E = 15V, R_1 = 1k, R_2 = 3k, R_3 = 1k, R_L 1k,

V_Z = 4V6, R_Z = 0, I_{Zmin} = 3mA and U_{BE} = 0.7V, β = 180, calculate:

a) output voltage of the stabilizer,
b) Operational amplifier output voltage.

13) Task

Fig.5 shows a schematic of an adjustable voltage stabilizer built using the LM317 circuit. Determine the components of the circuit and give the minimum value of the input voltage, so that the output voltage of the stabilizer can be adjusted from 5 to 12 V.

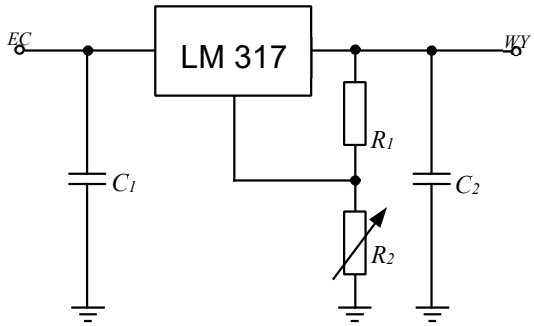

Fig.5.