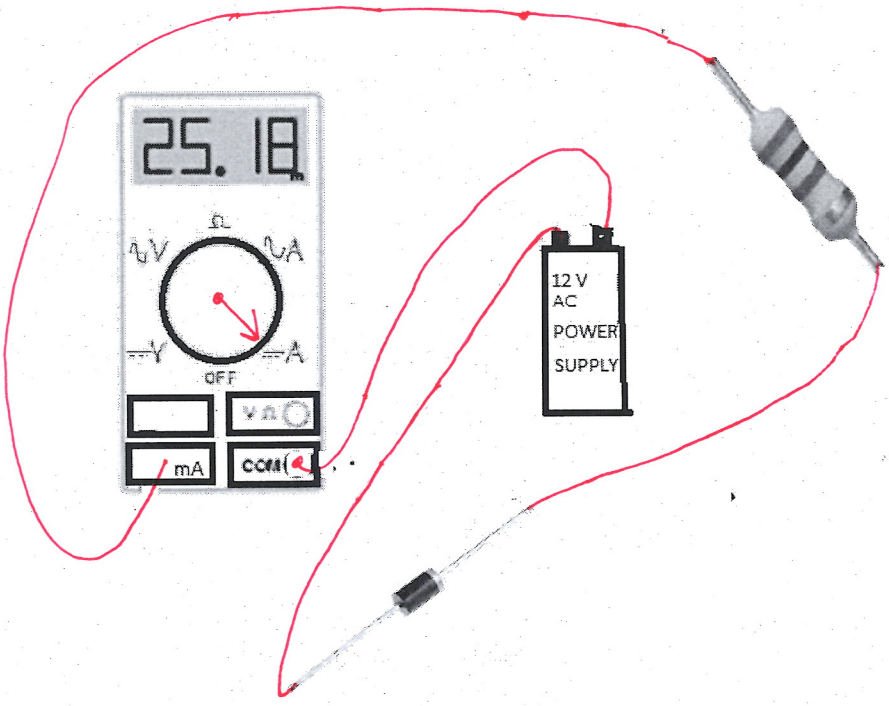
Electronics Lab

Q1

a) Connect the resistor, diode, power supply to built a half wave rectifier circuit and measure the DC output current with using the multimeter. (AC Power Supply 12V RMS, 1Hz, RL=1K)



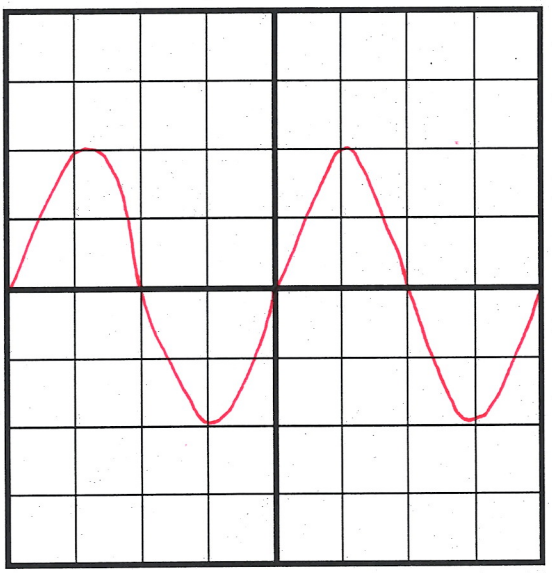
b) What is the aproximately maximum and minimum voltage values (Vmax) of input (AC Power Suuply) and output (RL) signals ?

$V_{max} = V_{in} \sqrt{2}$

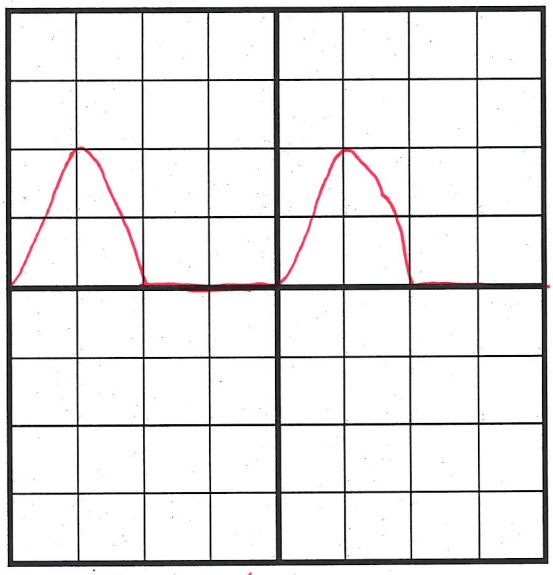
Vmax for input =..... $12 \cdot \sqrt{2} = 12 \cdot 1,4 = 16,8V$ Vmax for output=..... $16,8\ V$

Vmin for input=..... $-16,8V$ Vmin for output=..... $0\ V$

c) We connect CH1 of osciloscope to AC Power Supply and CH2 of osciloscope to RL.
Draw the signals, which we can see in osiloscope.
You should write the osciloscope volts/div and times/div values and draw the signals scaled.



Volts/div 8,4V Times/div 250ms CH1

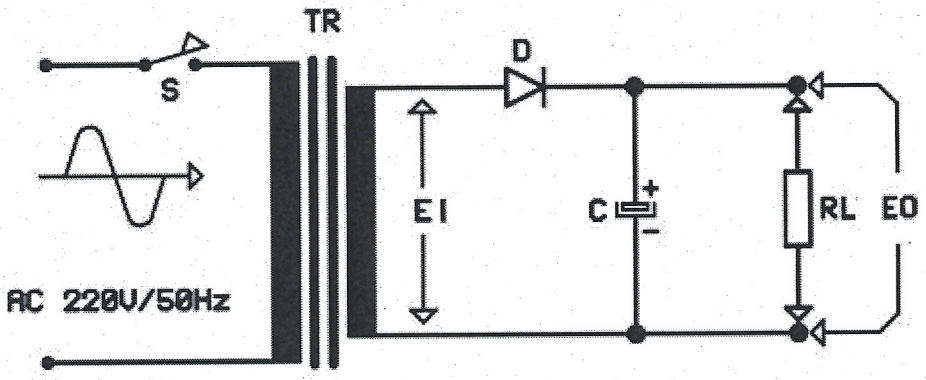


Volts/div 8,4V CH2 Times/div 250ms

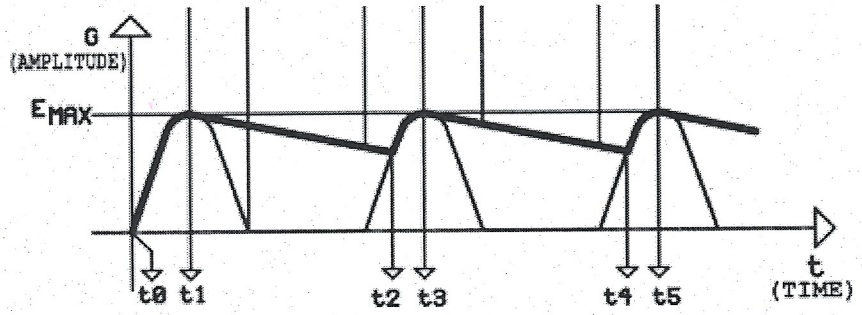
d) Calculate the mean DC output voltage and mean DC output current of the circuit.

$V_{DC\ mean} = \frac{V_{max}}{\pi} \rightarrow \frac{16,8V}{3} = 5,6V$ $I_{DC\ output}^{mean} = \frac{5,6V}{1k} = 5,6mA$

Q2 RL resistance is connected to an osiloscope.



a) (5p) Draw the output voltage roughly (E0)

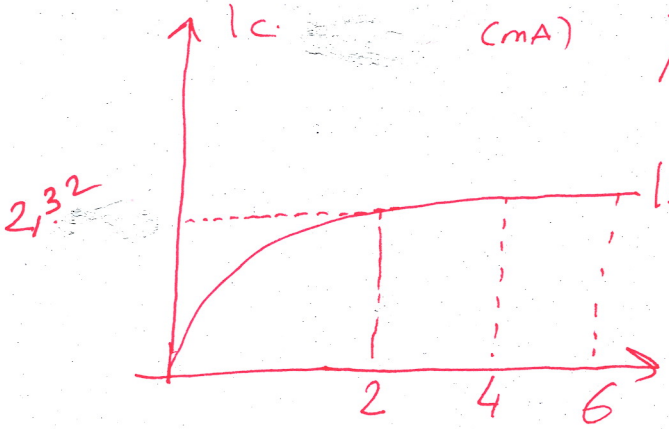


(5p) If the value of C increases, how does the peak to peak value of ripple voltage of E0 change? Why?

The peak to peak voltage decreases. Because time constant changes. (Time constant increases)

Q3 Draw the I_C vs V_{CE} characteristics (do not forget to entitle axis) using the values given in table and calculate the beta current gain using table. (Note: Units of IC is mA)

IB=20μA CONSTANT		
ORDER	VCE(V)	IC
1	0,02	0,06
2	0,04	0,19
3	0,06	0,35
4	0,08	0,54
5	0,10	0,70
6	0,50	1,37
7	1,00	1,95
8	2,00	2,30
9	4,00	2,32
10	6,00	2,32
11	8,00	2,32
12	10,00	2,32

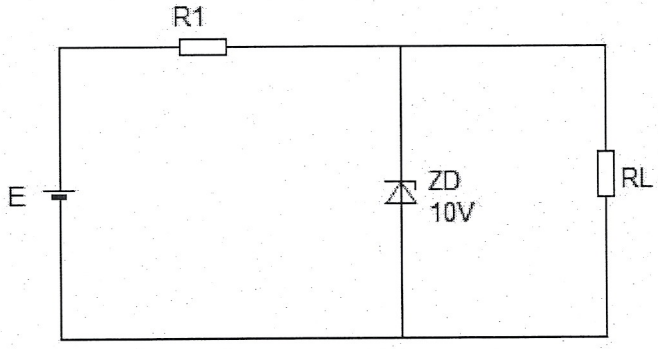


$I_C = \beta . I_B$

$\beta = \frac{I_C}{I_B} = \frac{2,32\ mA}{20\ MA}$

$I_B = 20\ MA = \frac{2320\ MA}{20\ MA} = 116$

Q4 Answer the questions with using Figure. R1=100 Ohm, RL=400 Ohm.



a) Calculate and fill the table.

	IR1 (mA)	IRL (mA)	VR1 (V)	VRL (V)
For E=5V	10	10	1V	4V
For E=14V	40	25	4	10

For E=5V

$I_{R1} = I_{RL} = \frac{5\ V}{100+400} = \frac{5V}{500\ ohm} = 10mA$

$V_{RL} = 100 . 10mA = 1V$

$V_{RL} = 5V - 1V = 4V$

For E=14V

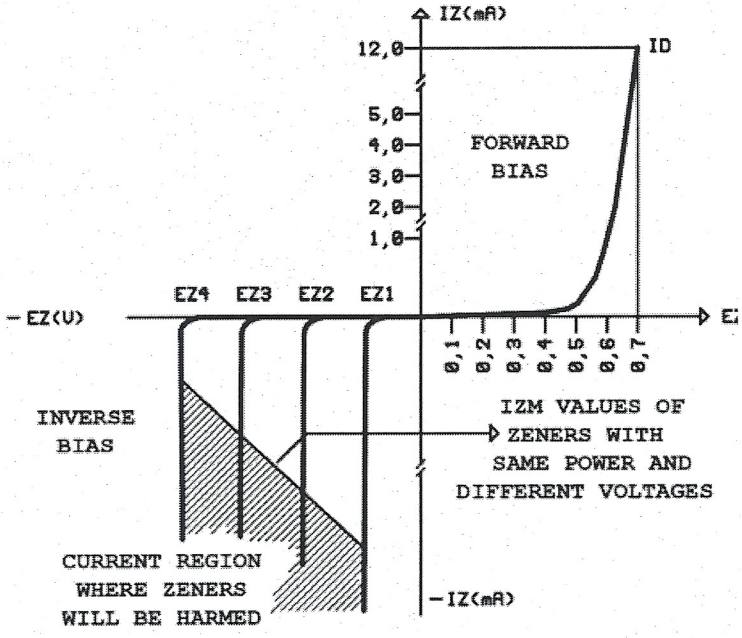
$I_{R1} = \frac{14V - 10V}{R_1} = \frac{4V}{1000\ ohm} = 40mA$

$V_{R1} = 14 - 10 = 4V$

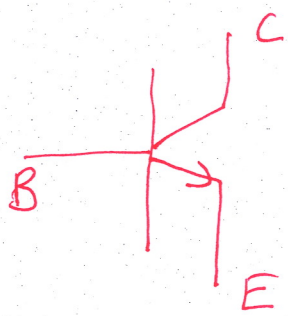
$V_{RL} = 10V$

$I_{RL} = \frac{10\ V}{400\ ohm} = 25mA$

b) Draw the full characteristics of zener diode (Vz-Iz graphics)



Q5 Draw a symbol of NPN BJT Transistor and sign the emitter, collector and base pins on it.



Q6 Draw a voltage tripler.