BIRZEIT UNIVERSITY

<u>ELECTRONICS I</u>

<u>ENEE 233</u>

<u>Project I</u>

"Automatic Light controller "

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ABSTRACt :

Objective:

This project has many aims first of all to make the light shines in the night and to who to use the board in the project and who to connect the electronic component between each other .

Equipment Required:

1. Sensor (variable resistor).
2. Relay .
3. Resistor.
4. Transistor.
5. Transformer.
6. Lamp.
7. AC Voltage.
8. Capacitor.
9. Diode .
10.   Board .
11.   Wires.
12.   Potential meter

Theory:

The AC voltage is connected to transformer to step down AC source amplitude , and connect the transformer to full wave rectifier center tapped to transfer AC

voltage to DC voltage equal (6volt). After that we connect to the CRT a large capacitor (1000μF) to remove AC ripple content connect to photo cell (this work like a variable resistor) and connect this component to small capacitor an two resistor (Rvar, R).

When the voltage between base and emitter (Vbe=$\frac{6*Rpcc}{(Rpcc+2.2k+Rvar)}$) large than 0.7volt , the transistor become in active region the current passing through the collector and passing the coils in RELAY so the switch in RELAY close and the lamp become on (give light) . But when Vbe less than 0.7volt the transistor will be in cut off region so no current passing through the RELAY and switch still of (lamp off).

The aim of variable resistor is to control the degree of darkness that lamp should be give light .the aim of small capacitor is to not let CRT give light directly, for example when someone make darkness for short time on photo cell. We used zenor diode to protect RELAY.

Note : we connect lamp to 220 AC volt not to 6 DC volt.

In this CRT we use RELAY as switch because the lamp connected to 220 AC volt and the transistor will be damaged in this high power.

we want to took in details about two important device (RELAY , photo cell)

RELAY:

Relays are one of the oldest, simplest, and yet, easiest and most useful devices. Before the advent of the mass produced transistor, computers were made from either relays or vacuum tubes, or both.

A relay, quite simply, is a small machine consisting of an electromagnet (coil), a switch, and a spring. The spring holds the switch in one position, until a current is passed through the coil. The coil generates a magnetic field which moves the switch. It's that simple. You can use a very small amount of current to activate a relay, and the switch can often handle a lot of current.

Photo cell (light sensor):

A photocell is a type of resistor. When light strikes the cell, it allows current to flow more freely. When dark, its resistance increases dramatically. Photocells need some calibration to be responsive in the exact lighting scenario you have. They can be used to detect large or small fluctuations in light levels to distinguish between one light bulb and two, direct sunlight and total darkness, or anything in between. Each scenario requires a slightly different voltage divider setup, which we'll get into below.

low r   high r
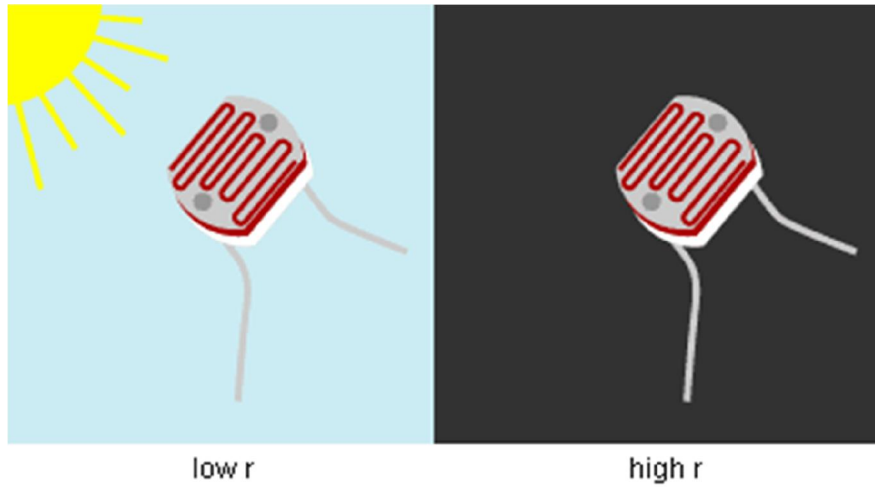
- **Consider the circuit in figure beside:**

We can devide the circuit into multi stages as:

Stage 1:dc power supply:it is known that the dc power supply change the ac signal into almost purely dc signal throw multi stages as follow:

1-**bridge full-wave rectifier**:

In general ,the rectifier used to convert the ac voltage (zero average value) into a positive or negative pulsating voltage signal (non zero average value).

For our circuit,the period of the output signals is less than the input signal by half ,and the signal is up to the time axes(positive always).
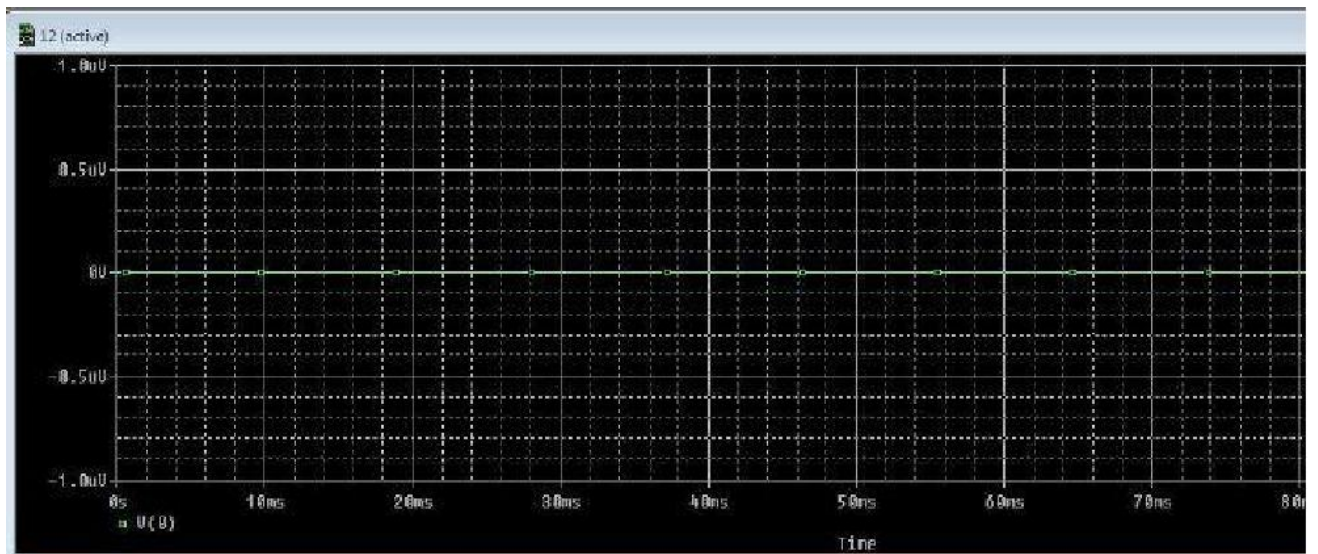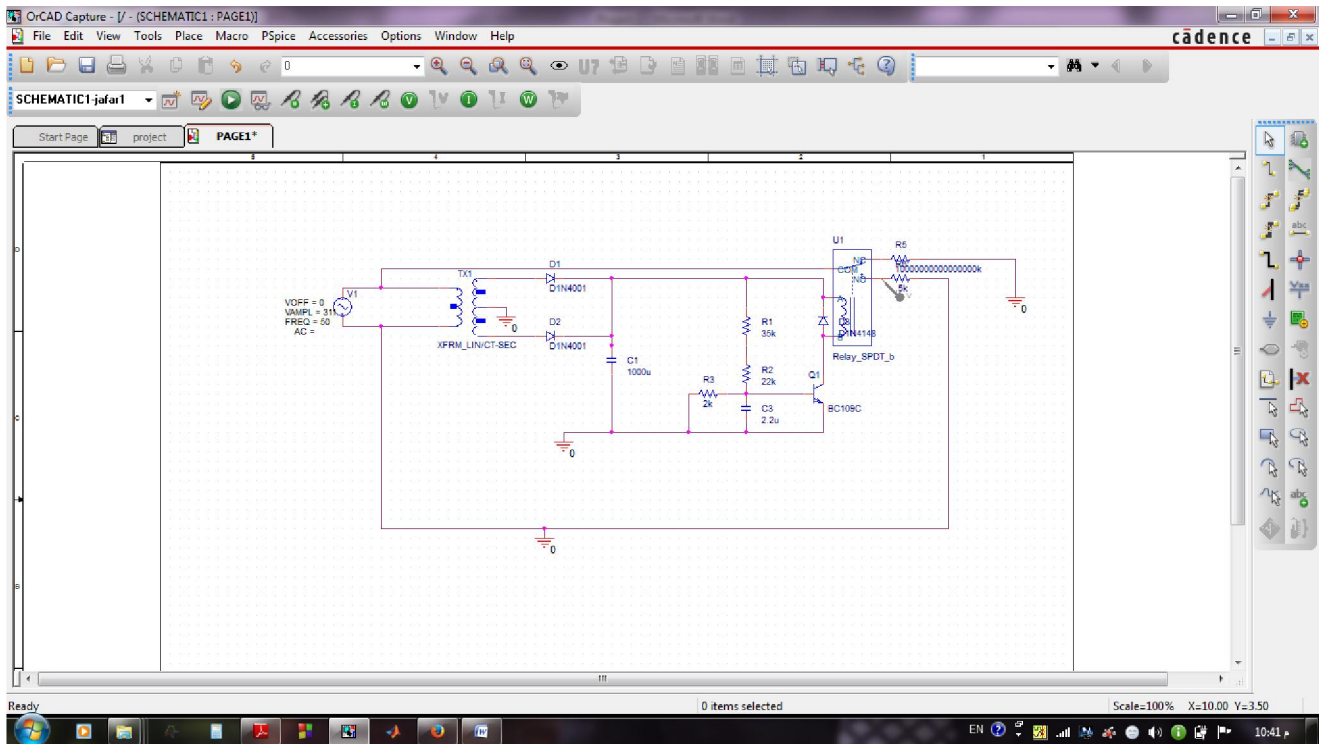
2-**Low pass filter**: ;it used to smoth out the pulsating dc produced by the rectifier by removing its dc ripple contents and paning its dc component(average value).

Simulation and some calculations :
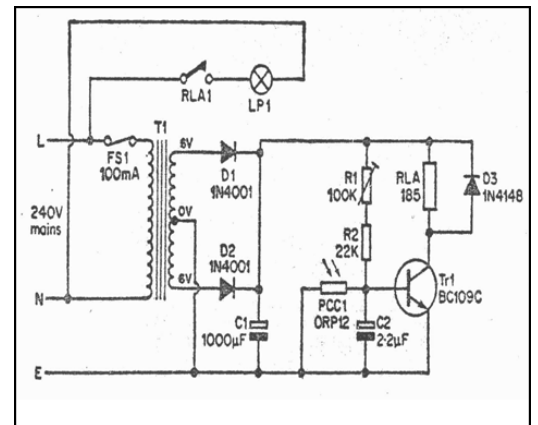
At R = 25 k (AT NIGHT)

AT R = 18 K
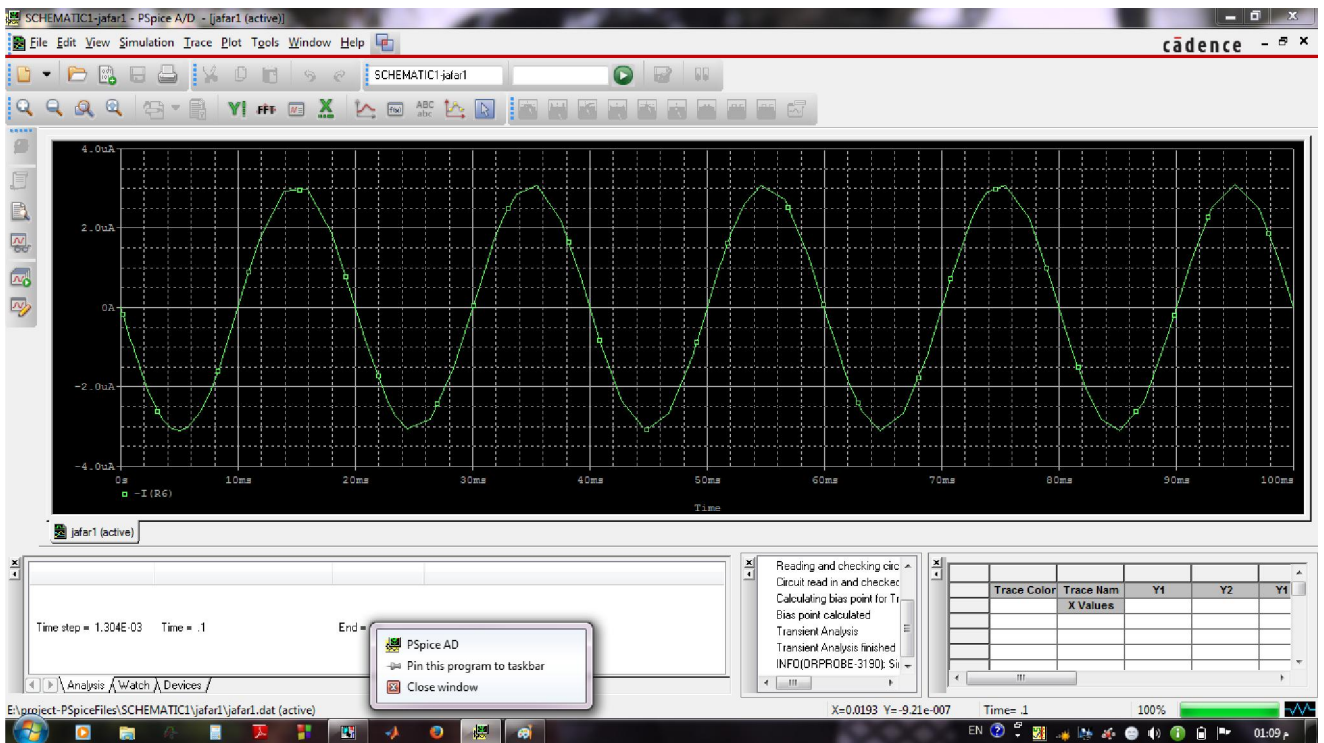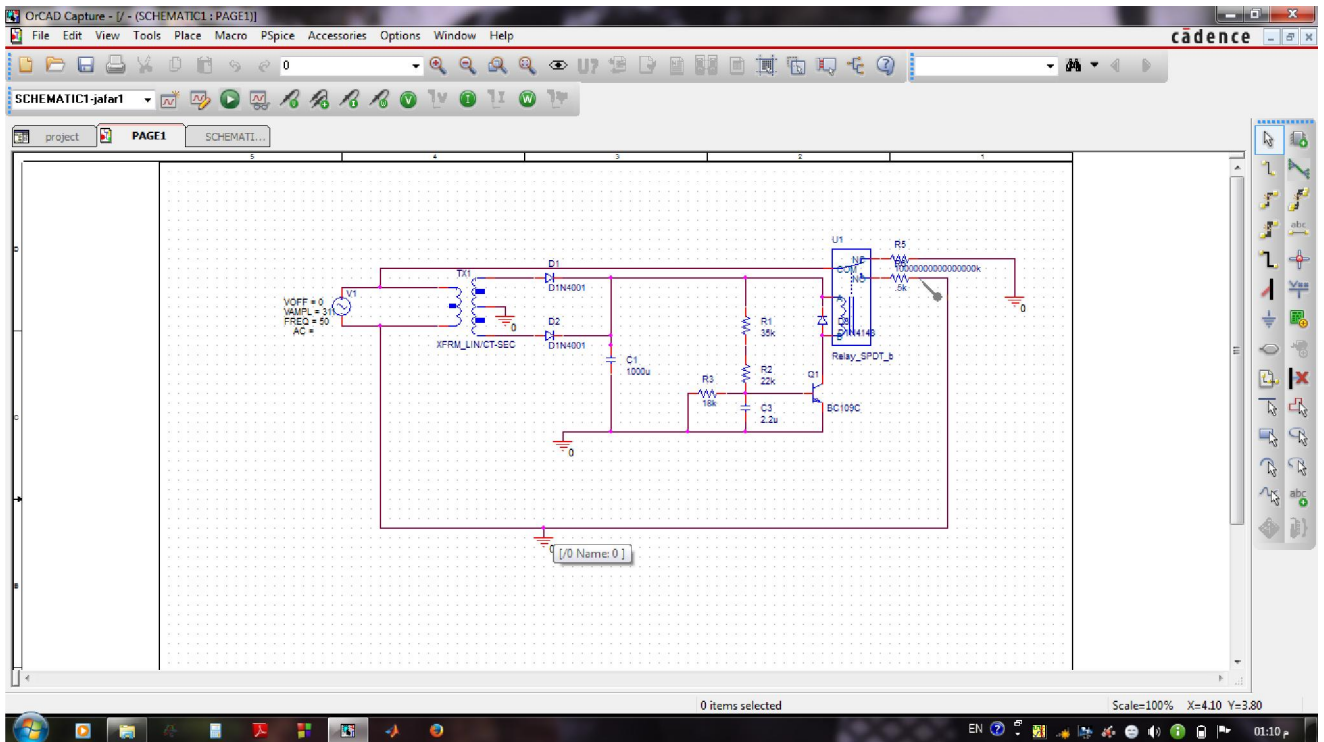
AT R = 2K (AT DAY)

NOTE THAT NO CURRENT.

Conclusions :

1) We note that the light is shining at night (which means the var (resistor) has a high values (25k)) and it is shown in the simulation .
2) We note that the light is off at day (which means the var (resistor) has a low values (2k)) and it is shown in the simulation .
3) We learn how to treat with bread board and how to connect an electronic components on it .
4) We learn the meaning of (work with team) and it is good experience .
5) We learn in practical way what is the functions of new electronic component (diodes , relay , transistor) .
6) Theoretical principles considered in the better way and understand lectures better than before .