



**ELECTRONIC SYSTEMS 2**  
**5260**

**CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD**

**Technical and Vocational Education Examinations**

**JUNE XXXX**

**INTERMEDIATE LEVEL**

Subject Title	<b>ELECTRONIC SYSTEMS</b>
Subject Code No.	<b>5260</b>
Paper No.	<b>TWO</b>

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**Duration: Three Hours**

**Answer question one and any three questions.**

Show all the steps in your calculations giving your answer at each stage and indicating the units and symbols used.

All sketches must be neat and clear.

You are allowed to use non programmable calculators

**You are reminded of the necessity for good English and orderly presentation in your answers.**

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## THEME : AUTOMATIC BATHROOM LIGHT WITH BACK-UP LAMP

Sometimes we forget to switch off the bathroom light and it remains on unnoticed for long periods. This circuit solves the problem of electricity wastage by switching off the lamp automatically after 30 minutes once it is switched on using S1. This circuit is installed in the apartment of your school principal. He observed that the circuit no longer operates as required.

He then seeks your expertise to curb the problem. This equipment whose circuit diagram is represented in figure 1 on page 5 contains amongst other electronic functions those of power supply, timing circuit, interfacing and light signaling circuits. In your capacity as a qualified electronic technician, you have been charged to carry out repairs on this equipment. Extract of some technical documents, represented on page 3, have equally been placed at your disposal to facilitate your task. Carefully exploit these documents and answer the questions in the following two sections.

### 1. Power supply

- 1.1 Identify the type of power supply used in this system. (2 marks)
  - 1.2 Draw the block diagram of the power supply. (3 marks)
  - 1.3 Give the name of the component labeled REG. (2 marks)
  - 1.4 Give one advantage of this type of power supply. (1 mark)
  - 1.5 Name three criteria used to choose a transformer. (3 marks)
  - 1.6 Calculate the transformation ratio  $m$  of the transformer used in this system. (2 marks)
  - 1.7 Calculate the full load primary and secondary current. (2 marks)
  - 1.8 Give the role of each of the following components: C1, C2, C3 and C4. (4 marks)
  - 1.9 Use a security margin of 50% to calculate the voltage rating of the capacitor labeled C1. (2 marks)
  - 1.10 Choose from the following the standard voltage rating of the capacitor C1: 16V, 25V and 35V. (2 marks)
  - 1.11 Choose the reference of the component labeled REG from the datasheet provided in table 1. (2 marks)
- (Total = 25 marks)**

### 2. Timing circuit

It is built with the circuit made up of IC2, R2, R3, C5, C6 and R1. IC2 is 14 stage ripple – carry counter/divider and oscillator. The period of the signal produced at pin 9 of this integrated is  $T = 2.2 R3C6$  and the period of output output Qn is given as:  $T_{Qn} = 2^n T$

- 2.1 Give the role of the timing circuit in this system. (2 marks)
  - 2.2 Calculate the frequency of the signal produced at pin 9. (3 marks)
  - 2.3 Deduce the period of the signal produced at the output Q11. (2 marks)
  - 2.4 Deduce the flashing frequency of LED1. (2 marks)
  - 2.5 The resistors used in this system belong to the E12 series. Give the four band colour code of the resistor labeled R4. (4 marks)
  - 2.6 Explain the operation of this circuit block. (4 marks)
  - 2.7 Draw an equivalent circuit of the oscillator in this circuit block using two – input NAND gates. (3 marks)
  - 2.8 Give the name of the circuit block made up of R1 and C5. (2 marks)
  - 2.9 Explain the operation of this circuit block. (3 marks)
- (Total = 25 marks)**

### 3. Interfacing circuit

- 3.1 Give the role of the resistor labeled R5. (2 marks)
- 3.2 Name three criteria used to choose a silicon control rectifier. (3 marks)
- 3.3 Identify the firing mode of the silicon controlled rectifier used in this circuit. (2 marks)
- 3.4 Give the role of the diode labeled D7. (2 marks)
- 3.5 Explain the operation of the component labeled TL1. (3 marks)

3.6 It was observed that the lamp no longer goes off after 30minutes even though the timing circuit is functioning proper. In tracing the fault you discovered that the component labeled SCR is defective.

3.6.1 Identify the fault with this component. (2 marks)

3.6.2 Explain the answer to question 3.6.1. (4 marks)

3.7 Give three criteria used to choose an electromagnetic relay. (3 marks)

3.8 Draw an equivalent circuit using bipolar junction transistor. (4 marks)

(Total = 25 marks)

#### 4. Back – up lamp circuit.

4.1 Give the name of the circuit block designed with IC3. (2 marks)

4.2 Give the role of the diode D3. (2 marks)

4.3 Give the value of the voltage at pin 2 of IC3 in the absence of blackout. (2 marks)

4.4 Explain the behavior of the circuit made up of R7 and C6 when blackout occurs. (4 marks)

4.5 Calculate the period of the signal produced at pin 3 of IC3. (4 marks)

4.6 If the threshold voltage of a LED is 2V and the voltage at pin 3 of IC3 is 12V, calculate the current flowing LED3 and LED4. (3 marks)

4.7 Draw an equivalent circuit of the circuit implemented with IC3 using two – input NOR gates. (4 marks)

4.8 If the output voltage at pin 3 of IC3 is 12V and the threshold voltage for each LED is 2V, calculate the current flowing through the LEDs. (2 marks)

4.9 Explain why these LEDs are connected in series. (2 marks)

(Total = 25 marks)

#### 5. The automatic bathroom light with back – up lamp can be implemented with the use of a computer.

5.1 Copy and complete the table below. (5 marks)

Computer port	Peripheral used
USB	
LPT	
COM	
audio	
RJ45	

5.2 Name three functions of the operating system. (3 marks)

5.3 Name one operating system commonly installed in our computers today. (1 mark)

5.4 Write short notes on each of the following

5.4.1 Serial transmission (4 marks)

5.4.2 Parallel transmission (4 marks)

5.4.3 Synchronous transmission (4 marks)

5.4.4 Asynchronous transmission (4 marks)

(Total = 25 marks)

**Table 1 : Datasheet of the component labeled REG**

Type	Vsm	ISmax	Type	Vsm	ISmax
7809	+9V	1A	7909	-9V	1A
78012	+12V	1A	79012	-12V	1A
78L09	+9V	100mA	79L09	-9V	100mA
78L12	+12V	100mA	79L12	-12V	100mA

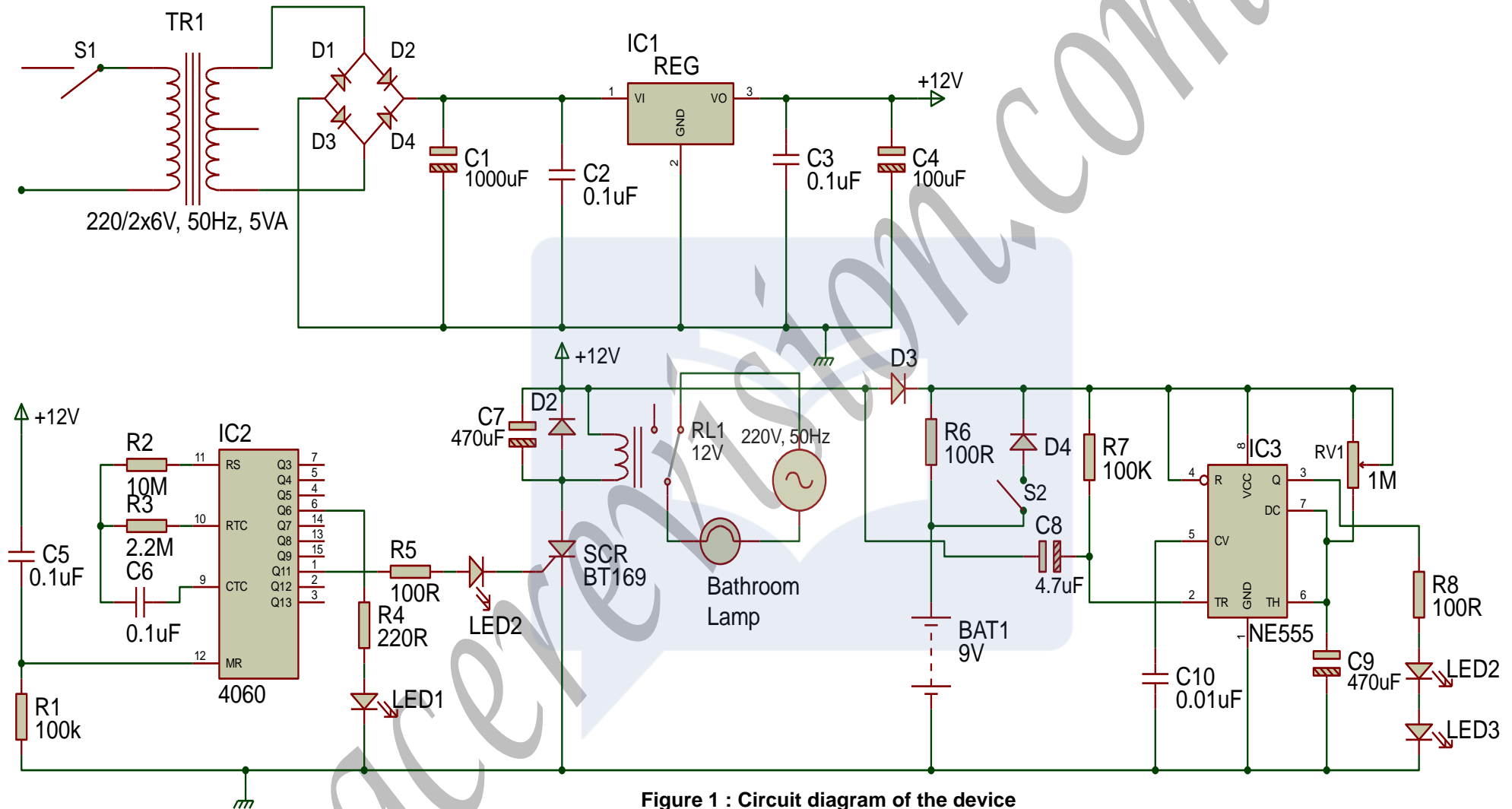


Figure 1 : Circuit diagram of the device

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