

(25)

# EE102:-

LAB GROUP	→ L-8
DATE OF EXPERIMENT	→ 20/01/2016
STUDENT - I	→ K.Y.Ashok (150107027)
STUDENT - II	→ Kumar Indramani (150107028)
SESSION	→ Afternoon Session
TABLE NO	→ 14
EXPERIMENT NO	→ 01

## OBJECTIVE →

To measure frequency, Time period and Amplitude of triangular and Square Wave forms, formed on an Oscilloscope by a function generator, also to find the values of given resistances and the capacitance using suitable colour code.

## OBSERVATIONS →

Triangle Wave form:-

Time Scale → 0.1 ms

No. of divisions → 4.2

Period →  $4.2 \times 10^{-4}$  s

Frequency → 2.38 kHz

Square wave form:-

Time Scale → ~~5ms~~ 0.1 ms

No. of divisions } → 2  
on x-axis }

Amplitude Scale → 1 V

No. of divisions } → 5.2  
on y-axis }

The Value of the given Resistances;

i) ~~330~~  $33 \times 10^3 \pm 5\%$ .  $\Omega$  (Orange - Orange - Brown - Gold)

ii)  $12 \times 10^4 \pm 5\%$ .  $\Omega$  (Brown - Red - Yellow - Gold)

iii)  $16 \times 10^3 \pm 5\%$ .  $\Omega$  (Brown - Blue - Orange - Gold)

iv)  $10 \times 10^4 \pm 5\%$ .  $\Omega$  (Brown - Black - Yellow - Gold)

The Value of the given Capacitance;

a)  $103\text{K} \rightarrow 10 \times 10^3 \text{ PF} @ 10^\circ\text{C}$ .

b)  $104\text{K} \rightarrow 10 \times 10^4 \text{ PF} @ 10^\circ\text{C}$ .

### RESULTS →

i) The Frequency of the triangular Waveform is 2.38 KHz.

ii) The peak to peak Voltage of Square Waveform is 5.2 V.

### CONCLUSIONS →

i) Frequency and peak to peak voltage shown by the Oscilloscope does not perfectly match with the frequency provided by the function generator.

ii) The Oscilloscope can be used to study various waveforms with suitable scales.

iii) The resistance value can be found easily by the colour code.

iv) The function generator can be used to generate any type of waveform required.

### PRECAUTIONS →

i) The frequency must not be exceeded from the permissible limit.

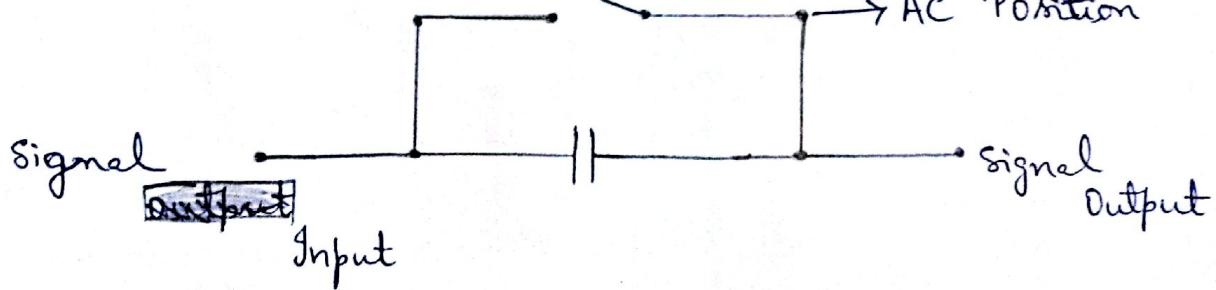
ii) The frequency must be tuned slowly and steadily to obtain the accurate frequency required.

iii) While the connections are made, care must be taken that the live is connected to live and the neutral to the neutral.

- care must be taken to trigger Oscilloscope properly.
- vii) The Wave form must be made symmetrical about references of Oscilloscope for accurate measurements.
- viii) One must calibrate the Oscilloscope properly for a good response which is not flat.

### Post-Experimental Analysis →

- The scale of the 'CRO' must be set carefully, so that the Amplitude and time period can be studied with greater accuracy.
- The core of the analog Oscilloscope is a special type of vacuum tube (Cathode Ray tube), which by electrostatic means steers the beam to specific areas on the screen, thereby allowing the human eye to view it and study the function.
- The Capacitor which comes into picture when Coupling mode is switched to AC; is the reason behind the waveform.



Circuit diagram:

ANSWERS:

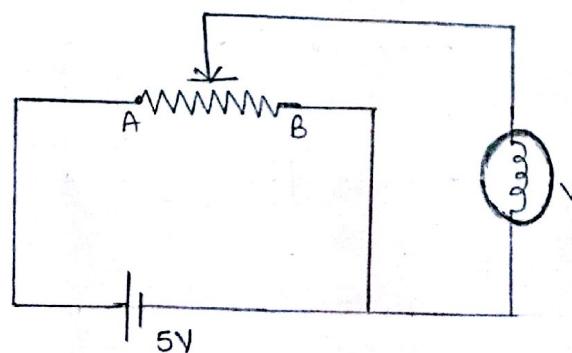
Q.3)

Colour Code	1 <sup>st</sup> digit	2 <sup>nd</sup> digit	Multiplier	Tolerance
Black	0	0	1	
Brown	1	1	$10^1$	1%
Red	2	2	$10^2$	2%
Orange	3	3	$10^3$	
Yellow	4	4	$10^4$	
Green	5	5	$10^5$	0.5%
Blue	6	6	$10^6$	0.25%
Violet	7	7	$10^7$	0.1%
Grey	8	8	-	0.05%
White	9	9	-	
Silver			$10^{-2}$	10%
Gold			$10^{-1}$	5%

Q.4) A diode has two legs. The shorter leg is generally the Cathode (-ve) and the longer one is the Anode (+ve)

Q.5) The notch on a transistor indicate the emitter.

Q.6)



→ When connection is at A; then voltage is 5V.

→ When connection is at B; then voltage is 0V.

EXERCISE:-Observations →

- a) Set a function generator to output a triangular Waveform of  $2.3 \text{ kHz}$ . Calculate the frequency of Waveform.

$$\text{Time scale} = 0.1 \text{ ms/division}$$

$$\text{No. of divisions} = 4.2$$

$$\text{Period} = 0.42 \text{ ms}$$

~~$$\text{Frequency} = 2.38 \text{ kHz}$$~~

- b) Obtain a Square Wave of frequency  $5 \text{ kHz}$  and amplitude  $5 \text{ V}_{\text{p-p}}$ .

$$\text{Selected Time scale} = 0.1 \text{ ms/division}$$

$$\text{Required no. of divisions on x-axis} = 2$$

$$\text{Selected amplitude scale} = 1 \text{ V/division}$$

~~$$\text{Required no. of divisions on y-axis} = 5.2$$~~

- Q.1) Write the Values of the resistances ( $\text{in } \Omega, \text{k}\Omega, \text{M}\Omega$ ) provided to you.

a) Orange - Orange - Brown - Gold  $(330 \pm 5\%, \Omega)$

b) Brown - Red - Yellow - Gold  $(120000 \pm 5\%, \Omega)$

c) Brown - Blue - Orange - Gold  $(160000 \pm 5\%, \Omega)$

d) Brown - Black - Yellow - Gold  $(100000 \pm 5\%, \Omega)$

- Q.2) What is the Value of a Capacitor on which  $\{103 \text{ K}\}$  is Written?

a)  $103 \text{ K} \rightarrow 10 \times 10^3 \text{ PF} @ 10\%$

b)  $104 \text{ K} \rightarrow 10 \times 10^4 \text{ PF} @ 10\%$

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(a)  
 $104 \text{ K}$

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EE102 : Basic Electronics Laboratory

**EXPT. No. 1: FAMILIARIZATION WITH THE LABORATORY EQUIPMENTS**

**1. Making Groups:** Grouping will be done on the first day of lab and each group will consist of 3 members.

**2. Suggested sitting arrangement for Groups:** The position of each group is marked on the experiment desks. Each group has to occupy the respective place.

**3. Announcements:** There will be 8 experiments.

(a) Lab. Evaluation is group-wise. [Lab Quiz & End sem evaluation on individual basis]

(b) Experiment 1 carries 6 marks and rest of the experiments carries 7 marks each: Lab. results (3 marks)+ Lab. reports (4 marks). Marks for the lab results/observations will be given on the same day of experiments while marks for the lab report will be given on the next lab day.

8 experiments carry  $(1 \times 6 + 7 \times 7) = 55$  marks

Mid semester (Lab Quiz) = 15 marks

End semester = 30 marks

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Total = 100 marks

**4. Lab report submission:** One common lab report for each experiment should be submitted by each group. Lab report submission must be on next lab day. Lab reports should be handwritten on A4 size paper.

**5. Please switch off your equipments and clean your table before leaving the lab. Otherwise, a penalty of 1 mark will be deducted per occurrence.**

**6. Announcement to be made by the instructor/TA**

- a. Switch on your function generator & Oscilloscope. Then, you proceed for demonstration
- b. Four TAs should divide the groups to demonstrate waveforms on the scope. Please demonstrate the calibration of the scope by showing the built-in square wave of 1 KHz in the scope (APLAB only 0.2V, Scientific 0.2V and 2V).
- c. The measurement of signal from function generator is to be carried out by the students. If the displayed value on the function generator is different from the value obtained through CRO reading, it should be mentioned accordingly in the lab report.

## EXERCISE

Perform the following exercise and write the observations on the sheet given for this purpose. Show your result to the TA/instructor and get the observations signed. Submit it in the next lab session along with the answers to the questions given at the end.

Set a function generator to output a triangular waveform of 2.3 kHz. Connect the output of the function generator to Channel 2 of an oscilloscope. Adjust appropriate knobs of the oscilloscope to get a stable display of the triangular wave. Measure the period of the waveform by counting the number of divisions per cycle on the time axis (x-axis) of the display and calculate the frequency of the waveform. Write the observations below

$$\text{Time scale} = 0.1 \text{ ms/division}$$

$$\text{Number of divisions} = 4.2$$

$$\text{Period} = 0.42 \text{ ms}$$

$$\text{Frequency} = 2.38 \text{ kHz}$$

With the oscilloscope connected, adjust the knobs of the function generator to obtain a square wave of frequency 5 kHz and amplitude 5 Vp-p by doing measurement on the oscilloscope screen (ignore the indicator on the function generator). Write the following parameters you have set on the oscilloscope.

$$\text{Selected time scale} = 0.1 \text{ ms/div}$$

$$\text{Required number of divisions on x-axis} = 2$$

$$\text{Selected amplitude scale} = 1 \text{ V/div}$$

$$\text{Required number of divisions on y-axis} = 5.2$$

Q1. Write the values of the resistances (in  $\Omega$ ,  $k\Omega$ , or  $M\Omega$ ) provided to you in the box using colour codes.

- a)  $330 \pm 5\% \text{ } \Omega$
- b)  $120000 \pm 5\% \text{ } \Omega$
- c)  $16000 \pm 5\% \text{ } \Omega$
- d)  $100000 \pm 5\% \text{ } \Omega$

Q2. What is the value of a capacitor on which 104K is written?

**Answer the following questions on a separate sheet and attach it to this sheet.**

Q3. Write the colour code used to specify the value of a resistance.

Q4. How cathode and anode are generally indicated on a diode?

Q5. What does the notch on a transistor indicate?

Q6. Draw a circuit diagram to generate a variable voltage from 0 to 5 V using a potentiometer and a fixed power supply of 5 V.