BARISAL ENGINEERING COLLEGE

DURGAPUR, BARISAL

LAB REPORT

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

Course Title : ELECTRICAL CIRCUIT (II) SESSIONAL

Course Code : EEE-1202

Name of Experiment : To analyze the frequency response of a RC Highpass filter

Date of Experiment :

Experiment No. :

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⊞ Name of the experiment: To analyze the frequency response of a RC Highpass filter for a specific cutoff frequency.

⊞ Objective: After completing this experiment we will know the effect of input frequency to the output of a H.P.F. We will also know how to draw semi-log graph of frequency vs gain or transfer function $H(\omega)$.

⊞ Theory: An H.P.F is formed when the output of an RC circuit is taken off the resistor shown in fig:(1).

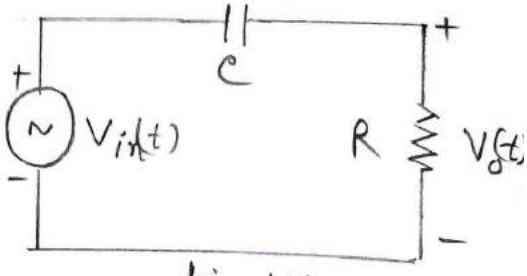


fig-(1)

The transfer function or gain of a H.P.S is,

$$H(\omega) = \frac{j\omega RC}{1 + j\omega RC}$$

In the fig:(2), the frequency vs gain graph showing the

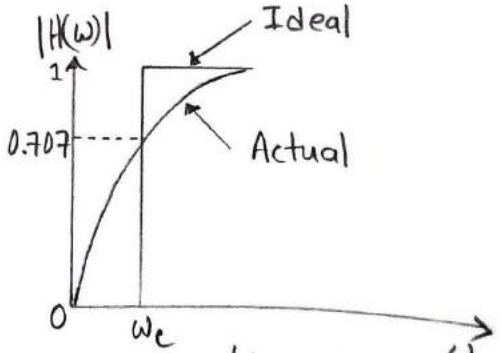


fig-(2)

ideal and actual frequency response of an H.P.F.

We know the cutoff frequency of on H.P.F is

$$\omega_c = \frac{1}{RC} \Rightarrow f_c = \frac{1}{2\pi RC}$$

Now, for our given cutoff frequency,

$$f_c = 1300 \text{ Hz}$$

Taking the resistance $R = 12.2\Omega$, the capacitance

$$C = \frac{1}{2\pi \times 12.2 \times 1300}$$
$$= 10\mu F$$

Now, taking 5V as input voltage, the required circuit will be same as fig:(3)

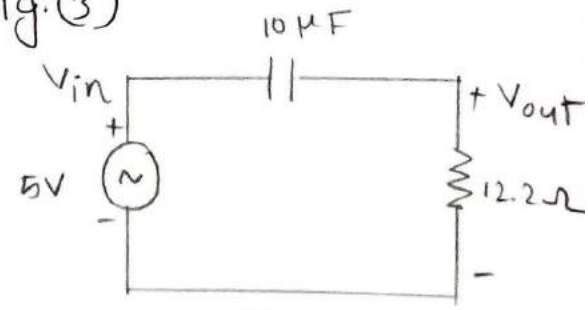


Fig : (3)

Apparatus:

(1) Frequency generator
(2) Oscilloscope
(3) Resistor
(4) Capacitor
(5) Breadbord
(6) Connectors

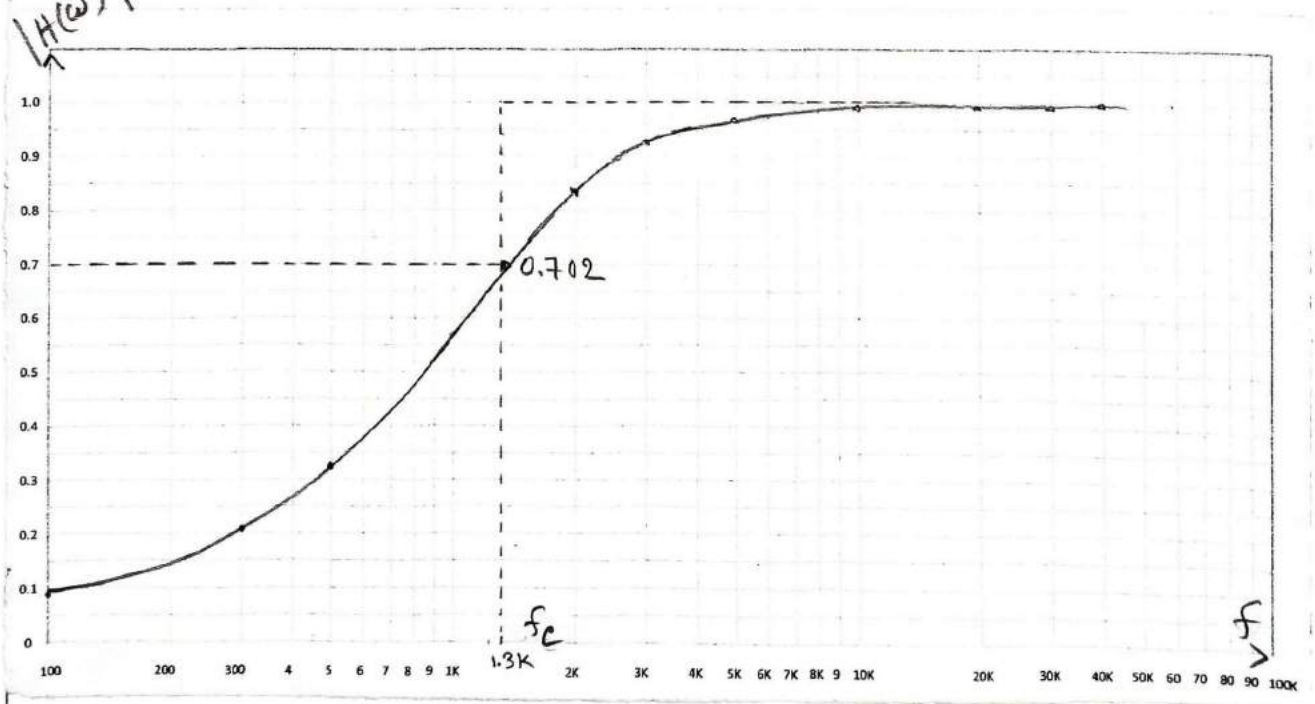
Procedure:

1. Make the circuit and connect frequency generator to the input.
2. To measure the frequency responses, connect CH-1 and CH-2 of oscilloscope to input and ouput respectively.
3. Go to the measure function of oscilloscope and set the peak-to-peak voltages of CH-1 and CH-2 to display
4. For a wide renge of frequency, in both side of cutoff frequency, note the VPP ~~and~~ of CH-1 and CH-2 and make a data table of frequency, VPP(in), VPP(out), and gain.
5. From the experimental value, draw a semi-logarithmic graph of frequency vs gain.

Data table:

	Frequency (Hz)	V_{in} (Pk - Pk)	V_{out} (Pk - Pk)	Gain $H(\omega) = \frac{V_o}{V_i}$
01	100	5	0.4	0.08
02	300	4.98	1.045	0.21
03	500	4.63	1.528	0.33
04	1K	4.2	2.394	0.57
05	1.3K	4.0	2.808	0.702
06	2K	3.8	3.192	0.84
07	3K	3.67	3.4131	0.93
08	5K	3.50	3.36	0.96
09	10K	3.1	3.038	0.98
10	20K	2.9	2.871	0.99
11	30K	2.7	2.673	0.99
12	40K	2.7	2.67	0.99

The semi-log graph of frequency vs gain



⊞ Calculation:

We know at cutoff frequency, the output gain is, $\frac{1}{\sqrt{2}} = 0.707$

From our data table,

At frequency 1300Hz, the gain is 0.702

or, at f_c , " " " 0.702

which is very closer to 0.707

Hence the cutoff frequency of this filter is 1.3 KHz

⊞ Result: Before cutoff frequency, the voltage gain increase highly. But after cutoff, the gain increase slowly as the frequency goes up. At cutoff frequency, the gain increase about ~~0~~70%.

⊞ Precautions:

1. Make sure the sine wave is eselected from the frequency generator.
2. Set both the coaxial cable of oscilloscope either 1X or 10X mood.
3. Make sure, both channels of oscilloscope is on.