

Linear Integrated Circuit

Task – 4

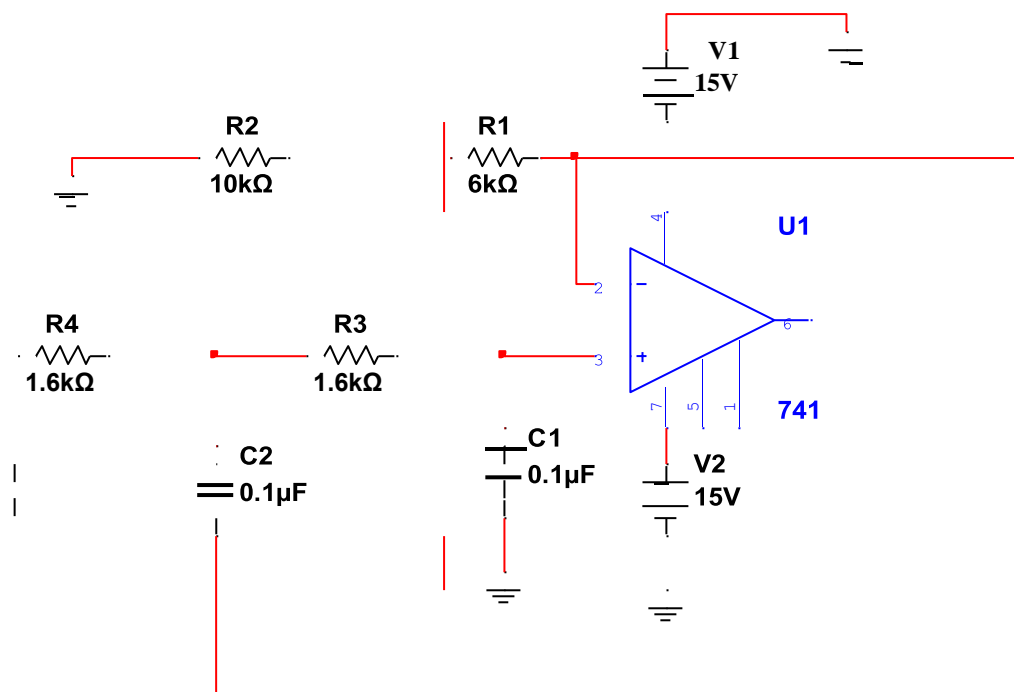
Name: Sparsh Arya
Registration Number: 17BEC0656
Slot: G1+TG1

Aim

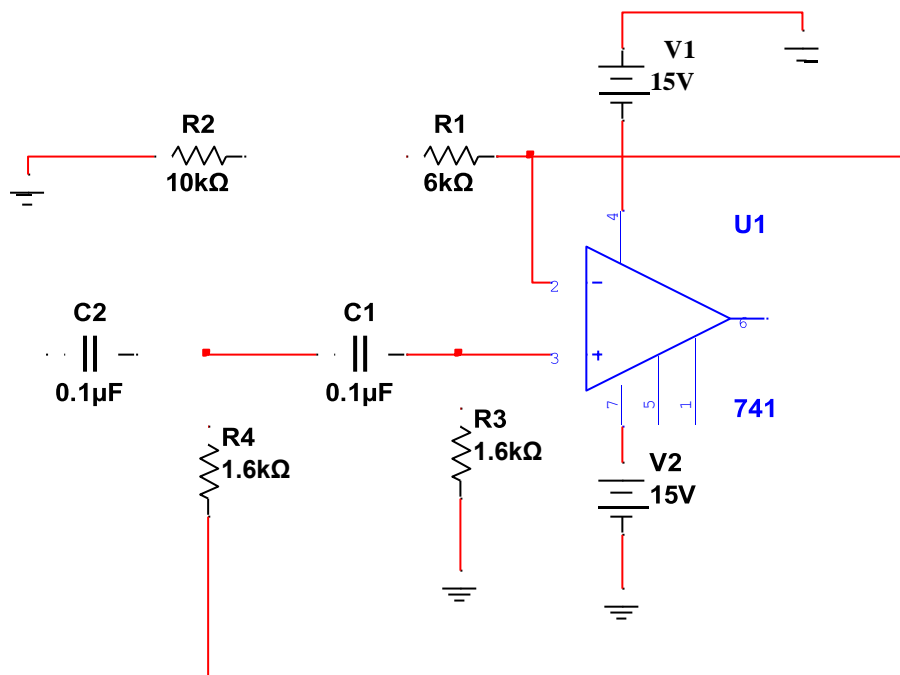
To design a 2nd order low pass filter and a 2nd order high pass filter with cutoff frequency 1 KHz. Also, if input frequency = 500Hz ~20 KHz calculate gain. Let input voltage be 1 V.

CIRCUIT DIAGRAM:

LOW PASS FILTER



HIGH PASS FILTER



CALCULATIONS AND MULTISIM MODELLING:

Given:

$$C = 0.1\mu\text{F}$$

$$f_c = 1 \text{ KHz}$$

Damping factor α of a butterworth filter is =

$$1.414 R = 1/2\pi fC = 1.6\text{K}\Omega$$

$$\text{Gain (A)} = 3 - \alpha$$

$$1 + (R_f/R_i) = 3 - 1.414$$

$$R_f/R_i = 0.6$$

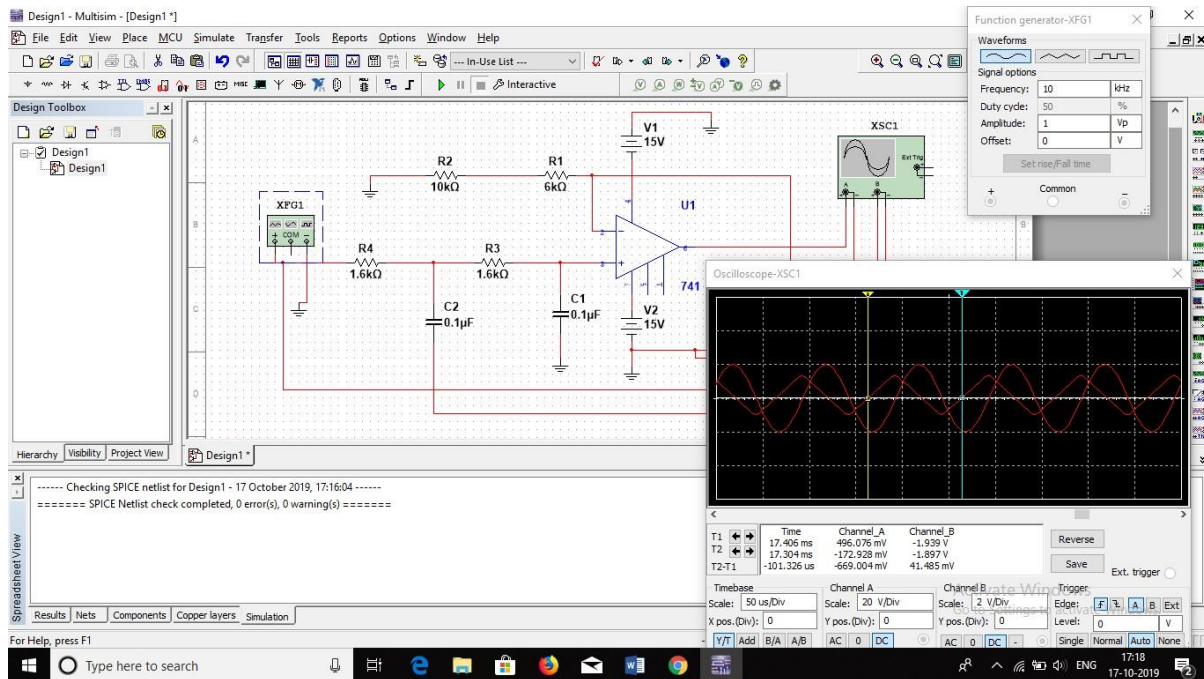
Let,

$$R_i = 10 \text{ K}\Omega$$

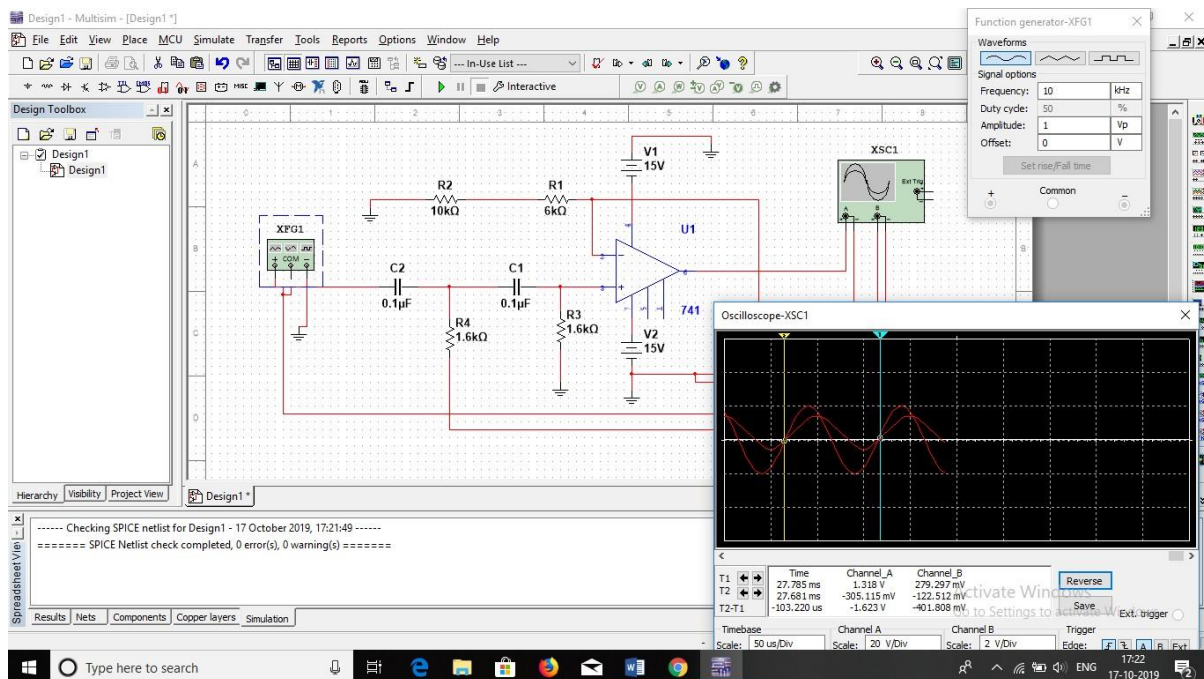
Then, — —

$$R_f = 6\text{K}\Omega$$

Low pass filter:



High pass filter:



COMPONENTS REQUIRED:

1. 741 op-amp
2. Resistors
3. Capacitors
4. Bread board
5. Function generator
6. Oscilloscope

RESULTS:

Gain(A)=1.62for both highpass and lowpass filters.

High pass:



Low Pass:



INFERENCE:

For a low pass filter as the frequency increases the output voltage decreases. And for a high pass filter as the frequency increases the output voltage increases.

ATTESTATION:

OBSERVATION TABLE (LPF)		
Frequency	V_o	$V_{in} = 1V$
500 Hz	2.34 V	
1 kHz	2.25 V	
2 kHz	2.18 V	
4 kHz	2.10 V	
8 kHz	2.05 V	
12 kHz	2.00 V	
15 kHz	1.98 V	

20 kHz	2.00 V
25 kHz	1.98 V
30 kHz	1.95 V
35 kHz	1.92 V

OBSERVATION TABLE (HPF)		
Frequency	V_o	$V_{in} = 1V$
500 Hz	0.98 V	
1 kHz	0.95 V	
2 kHz	0.90 V	
4 kHz	0.85 V	
8 kHz	0.80 V	
12 kHz	0.75 V	
15 kHz	0.70 V	
20 kHz	0.65 V	
25 kHz	0.60 V	
30 kHz	0.55 V	
35 kHz	0.50 V	

