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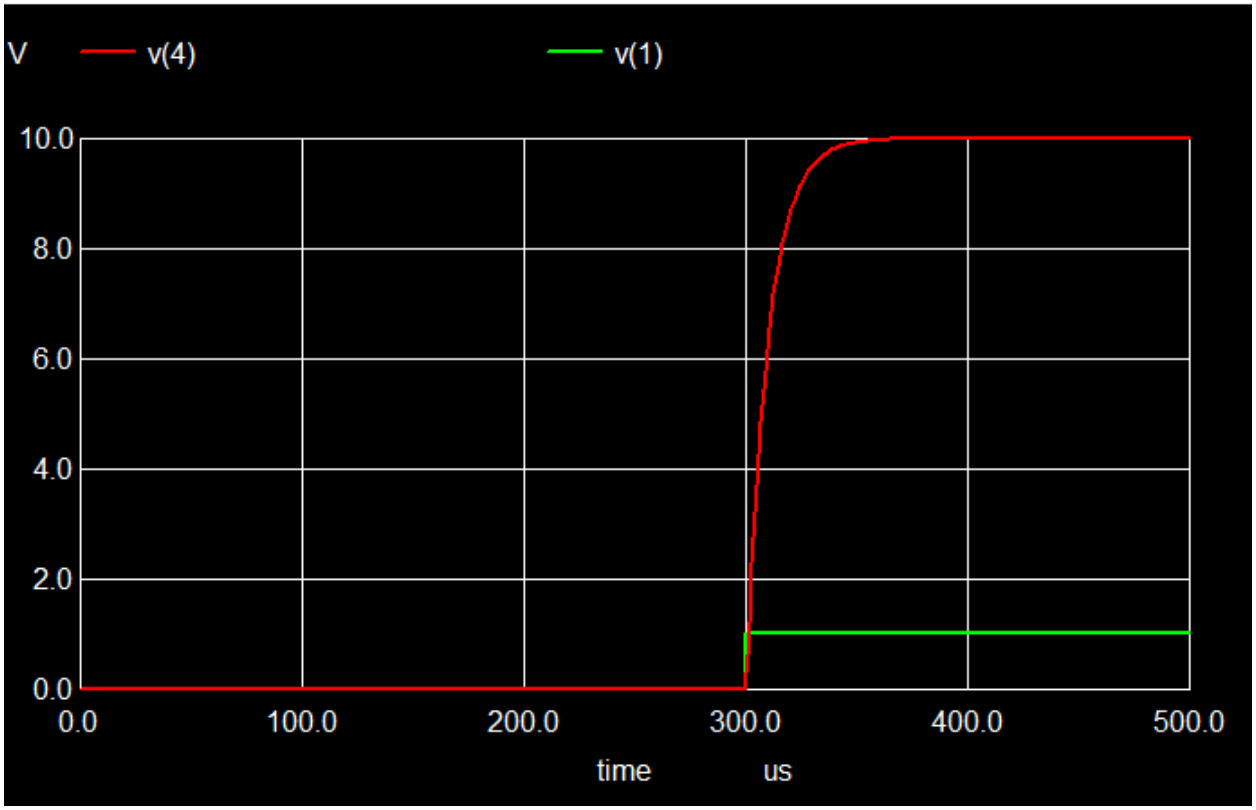
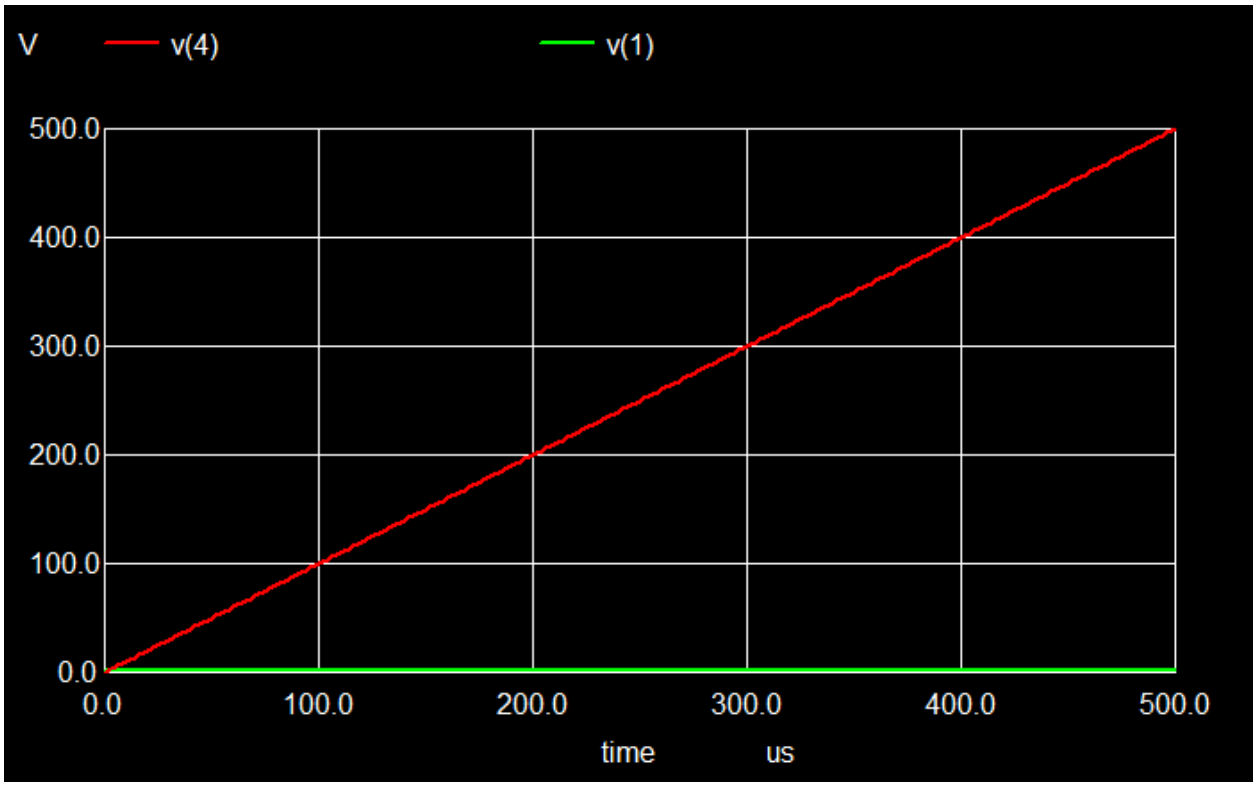
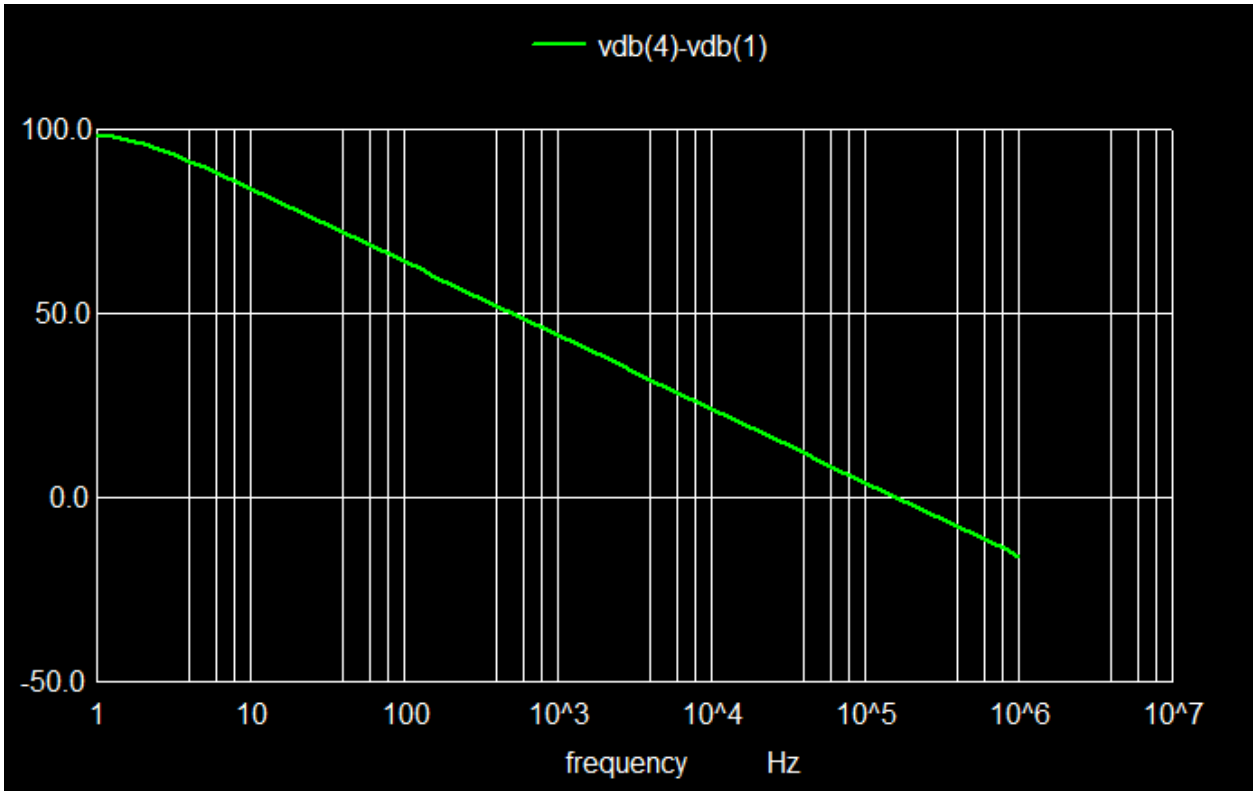
```
*Q1(a)
Vin 1 0 PWL(0 0 0.0003 0 0.0003 1)
Ein 1 2 5 0 1
G1 0 3 2 0 10m
C1 3 0 10n
E2 4 0 3 0 1
R1 4 5 9k
R2 5 0 1k
*Transient analysis
.tran 0.002ms 0.5ms
.control
run
plot v(1) v(4)
.endc
.end
```



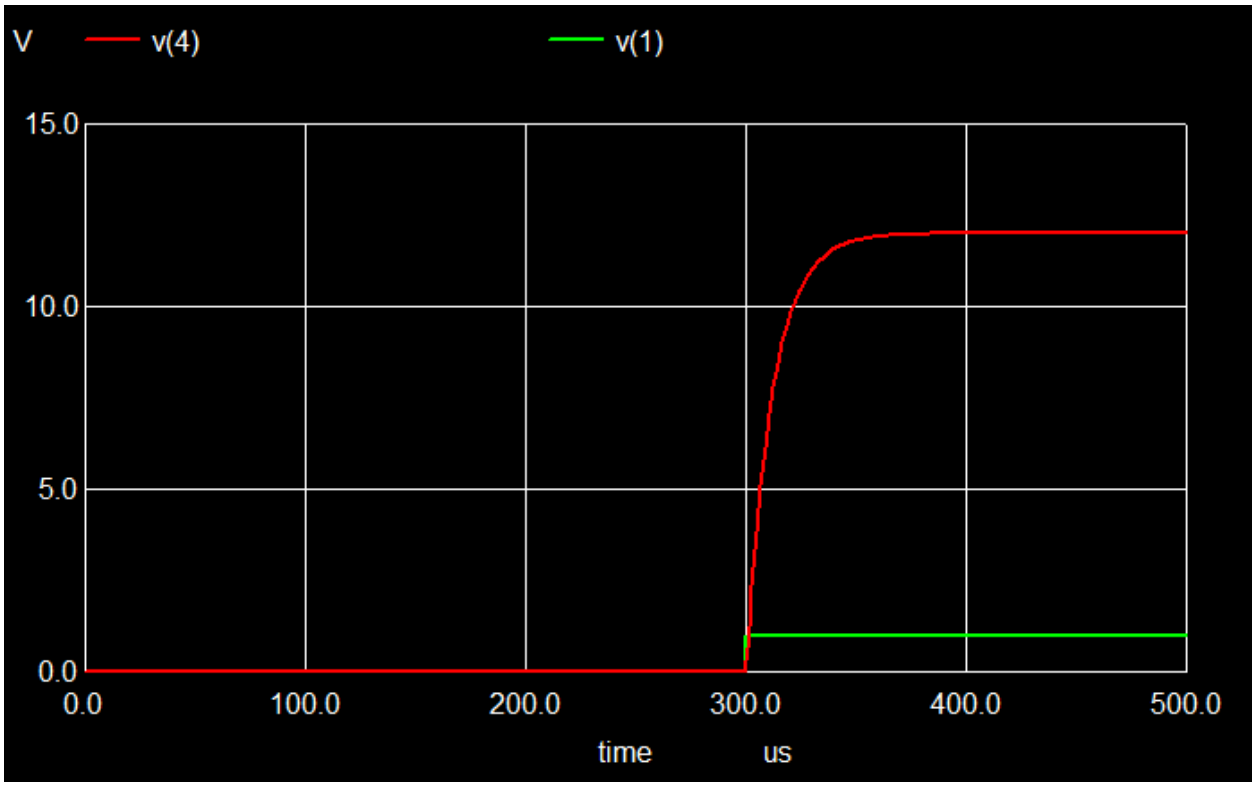
```
*Q1(b)
Vin 1 0 dc 1v
Ein 1 2 0 0 1
G1 0 3 2 0 10m
C1 3 0 10n IC=0V
E2 4 0 3 0 1
R1 4 5 11k
R2 5 0 1k
*Transient analysis
.tran 0.002ms 0.5ms uic
.control
run
plot v(1) v(4)
.endc
.end
```



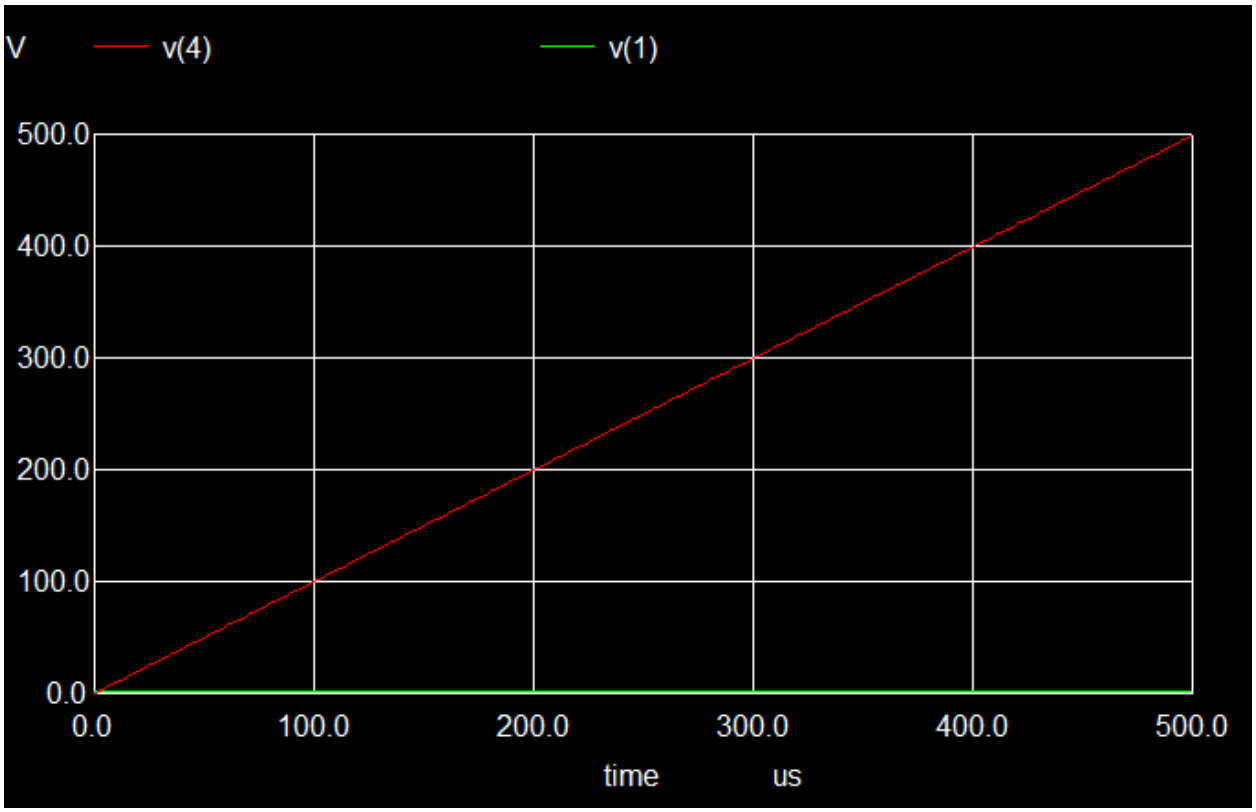
```
*Q1(c)
Vin 1 0 dc 0 ac 1
Ein 1 2 0 0 1
G1 0 3 2 0 10m
C1 3 0 10n IC=0V
E2 4 0 3 0 1
R1 4 5 11k
R2 5 0 1k
Rout 3 0 10Meg
*AC analysis
.ac dec 10 1 1Meg
.control
run
plot {vdb(4)-vdb(1)} xlog
.endc
.end
```



```
*Q1(d)-a
Vin 1 0 PWL(0 0 0.0003 0 0.0003 1)
Ein 1 2 5 0 1
G1 0 3 2 0 10m
C1 3 0 10n
E2 4 0 3 0 1
R1 4 5 11k
R2 5 0 1k
Rout 3 0 10Meg
*Transient analysis
.tran 0.002ms 0.5ms
.control
run
plot v(1) v(4)
.endc
.end
```

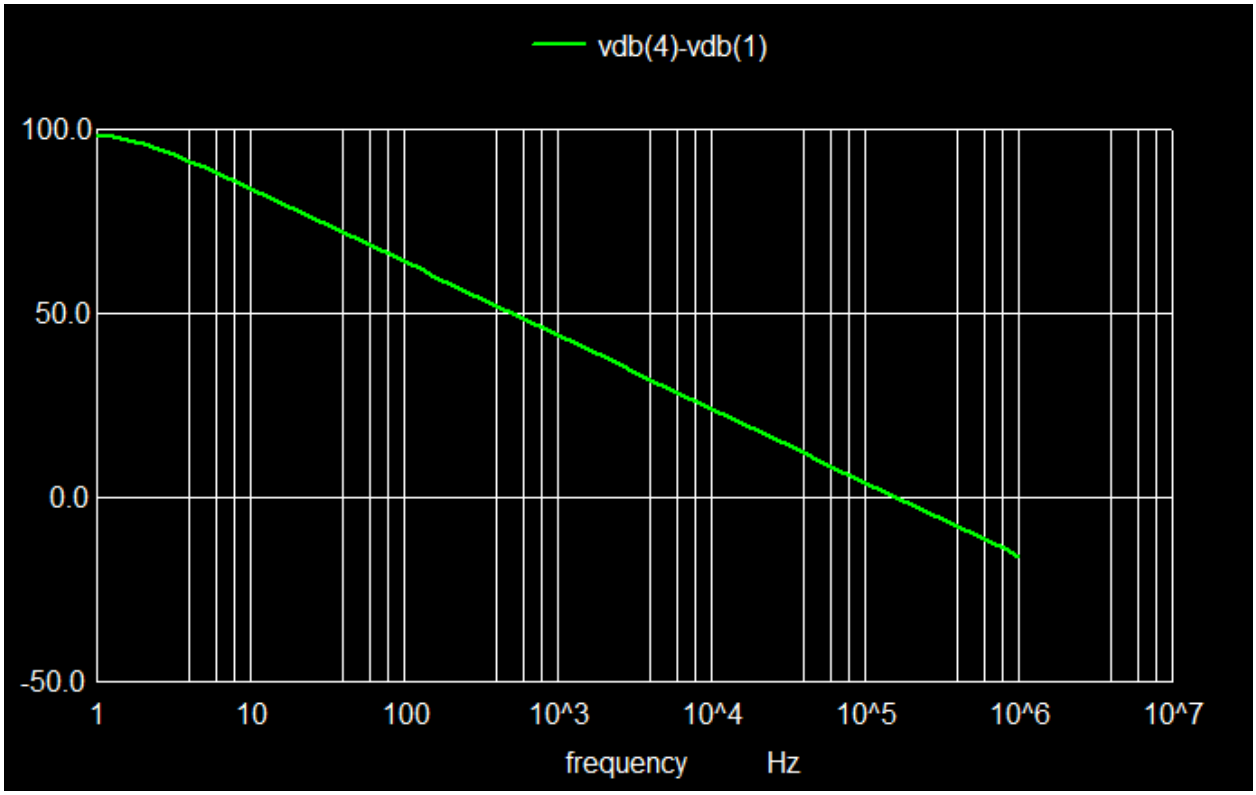


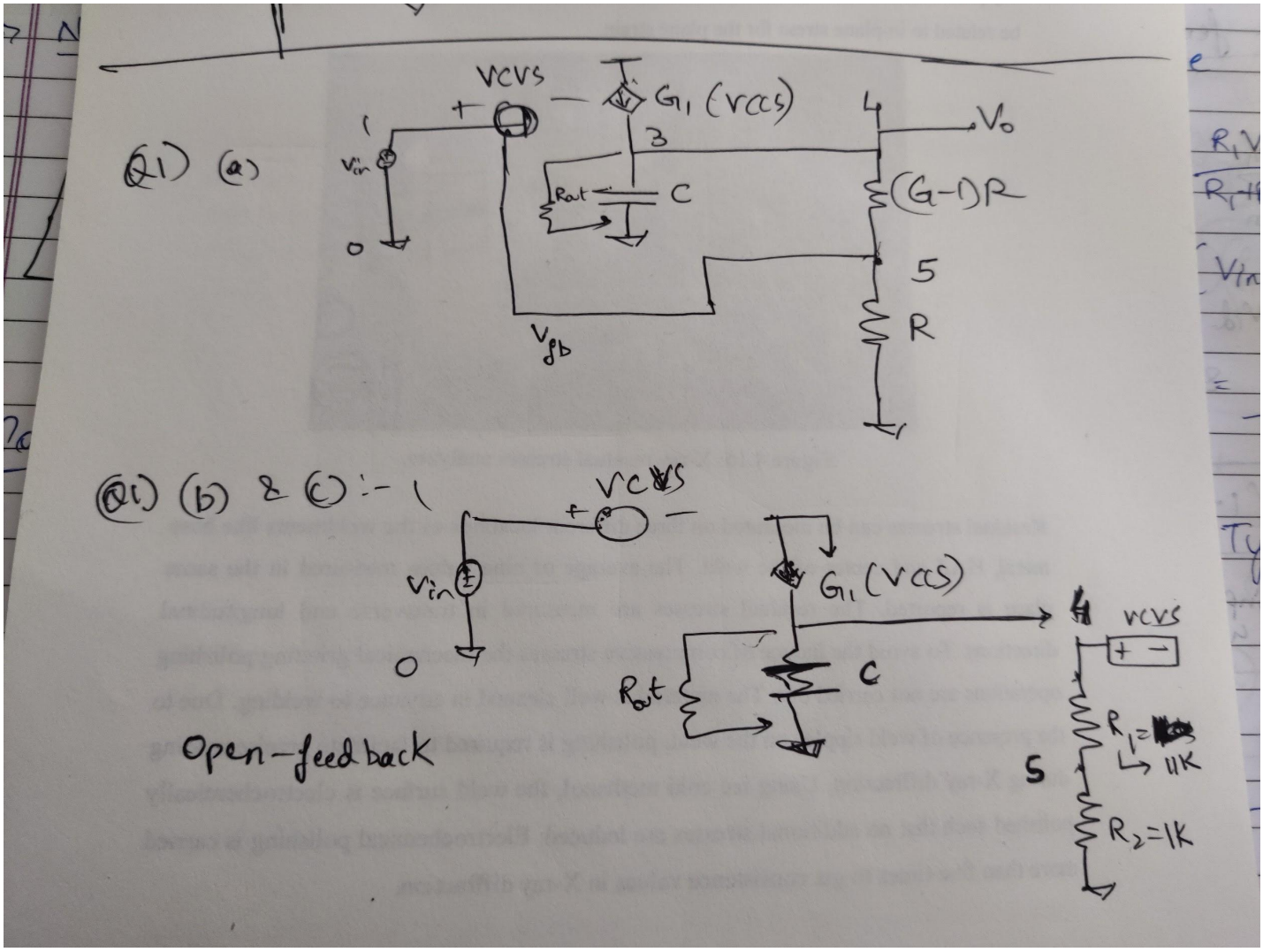
```
*Q1(d)-b
Vin 1 0 dc 1v
Ein 1 2 0 0 1
G1 0 3 2 0 10m
C1 3 0 10n IC=0V
E2 4 0 3 0 1
R1 4 5 11k
R2 5 0 1k
Rout 3 0 10Meg
*Transient analysis
.tran 0.002ms 0.5ms uic
.control
run
plot v(1) v(4)
.endc
.end
```




```
*Q1(d)-c
Vin 1 0 dc 0 ac 1
Ein 1 2 0 0 1
```

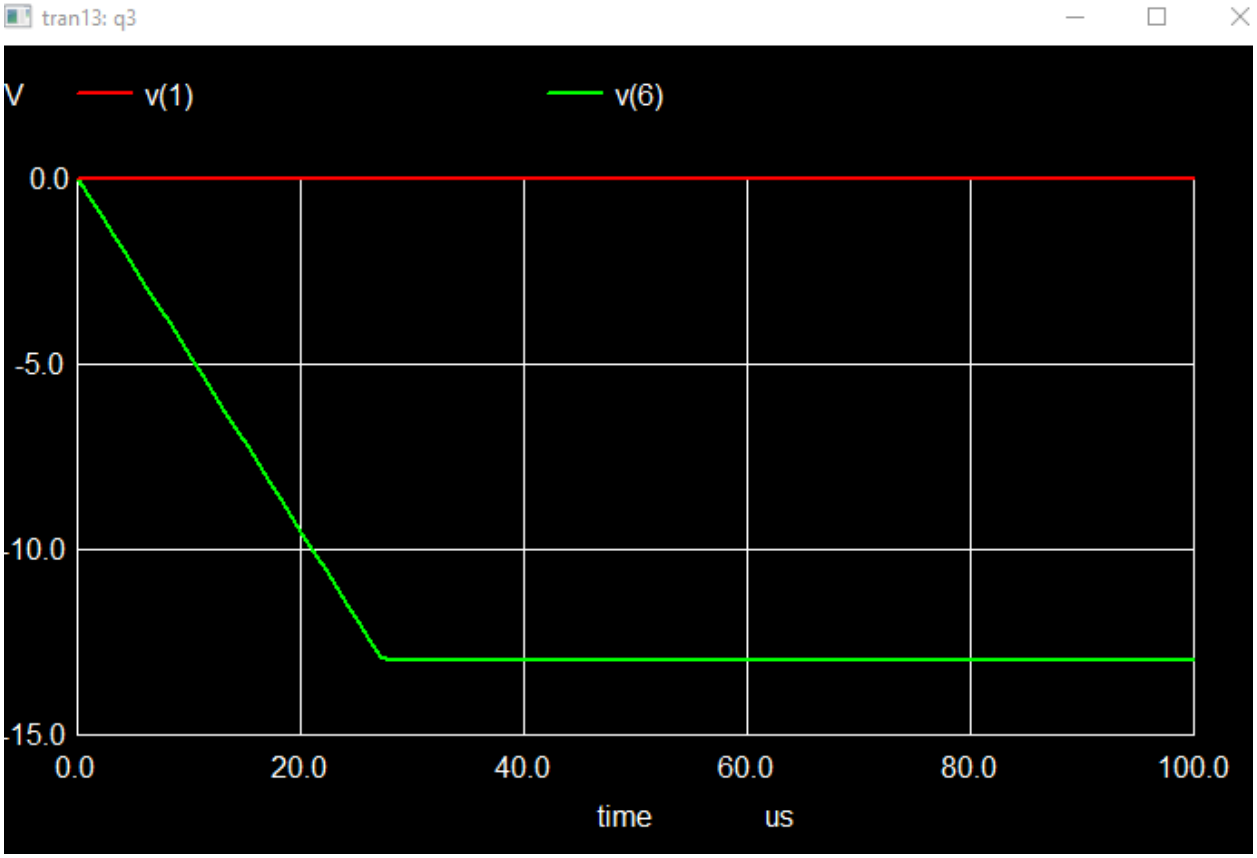
```
G1 0 3 2 0 10m
C1 3 0 10n IC=0V
E2 4 0 3 0 1
R1 4 5 11k
R2 5 0 1k
Rout 3 0 10Meg
*AC analysis
.ac dec 10 1 1Meg
.control
run
plot {vdb(4)-vdb(1)} xlog
.endc
.end
```





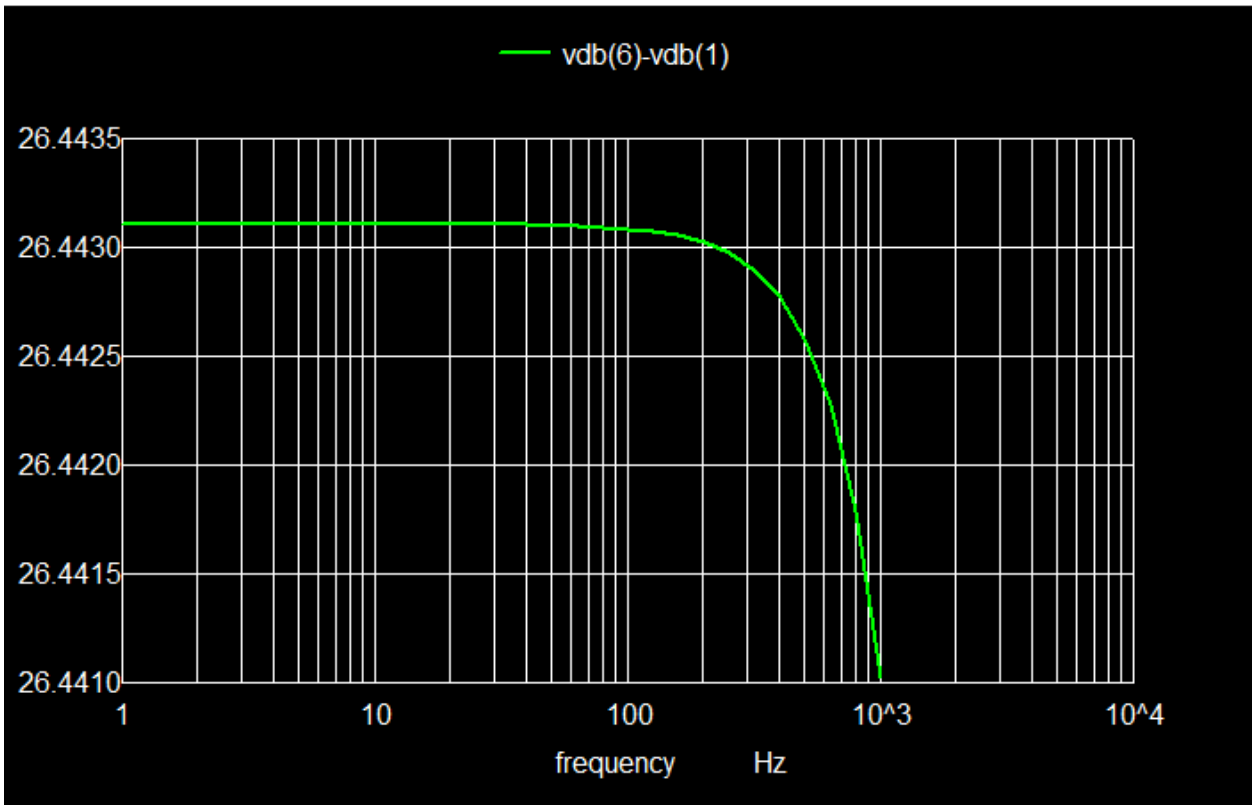

```
*Q3a
.include ua741.txt
Vin 1 0 dc 0 ac 1
R2 1 2 1k
X1 2 3 4 5 6 UA741
R1 3 0 500
R3 3 4 10k
Vcc 4 0 dc +15V
Vdd 5 0 dc -15V
RL 6 0 1k
.tran 0.001ms 0.1ms uic
.control
.ac dec 10 1 1k
run
```

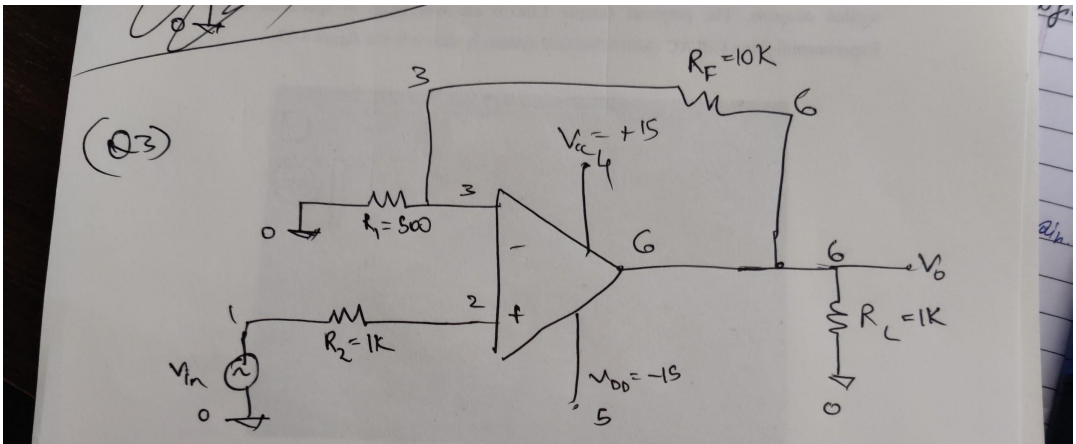
```
plot v(6) v(1)
.endc
.end
```




```
*Q3b
.include ua741.txt
Vin 1 0 dc 0 ac 1
R2 1 2 1k
X1 2 3 4 5 6 UA741
R1 3 0 500
Rf 3 6 10k
Vcc 4 0 dc +15V
Vdd 5 0 dc -15V
RL 6 0 1k
.ac dec 10 1 1k
```

```
.control
run
plot {vdb(6)-vdb(1)} xlog
.endc
.end
```





```
*Question 4
.include ua741.txt
x1 12 3 4 5 6 UA741
vin 1 0 dc 0 ac 1
R1 3 0 1k
Rin 1 2 50
R2 12 0 1k
C1 12 2 1.52E-5
C0 6 7 1.52E-5
RF 3 6 11k
RL 7 0 1k
*AC analysis
.ac dec 10 1 1k
.control
run
*black background
set color0=black
* white grid and text
set color1=white
* wider grid and plot lines
set xbrushwidth=2
plot vdb(7) xlog
plot {57.29*vp(7)} xlog
.endc
.end
```

$$f_L = \frac{1}{2\pi R C_{in}} ; \qquad C_{in} = ?$$

$$f_L = 10$$

$$R = R_2 + R_{in}$$

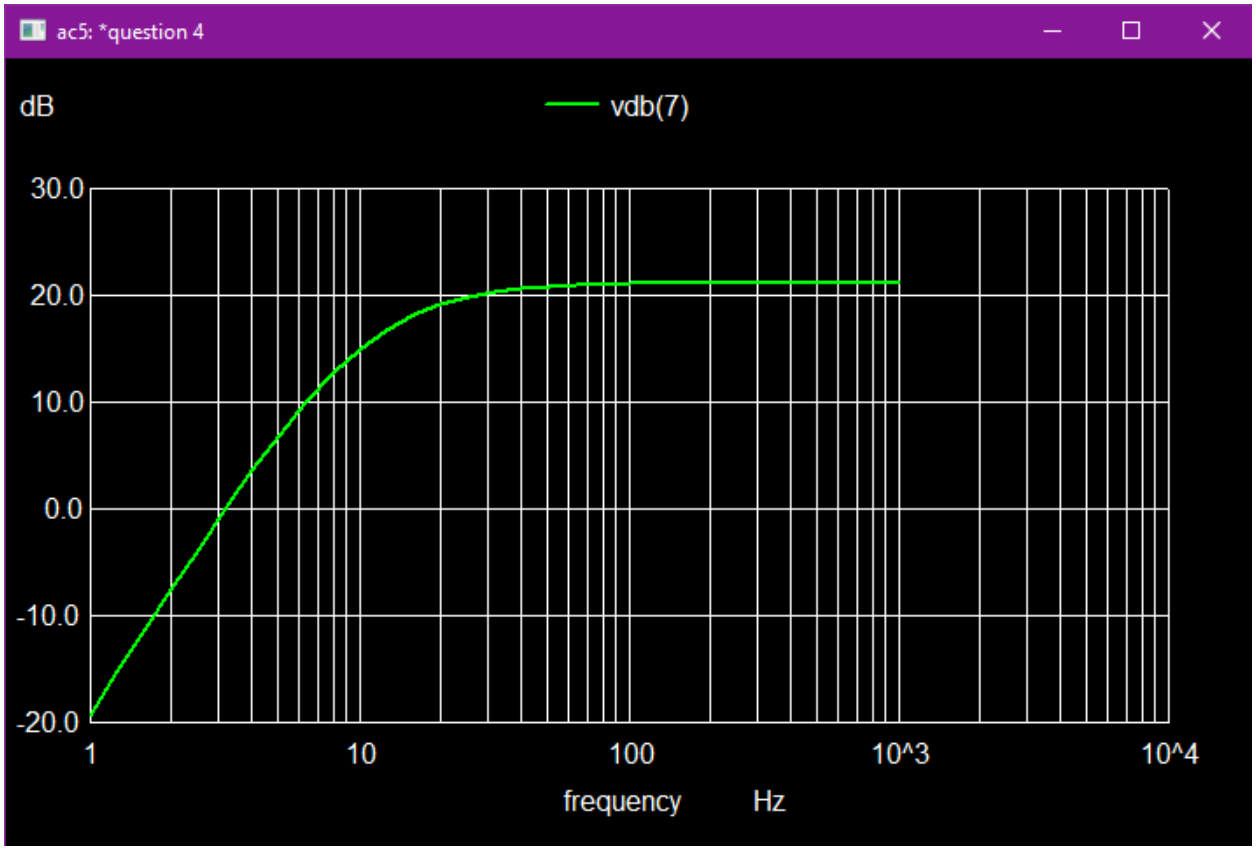
$$= 50 + 1000$$

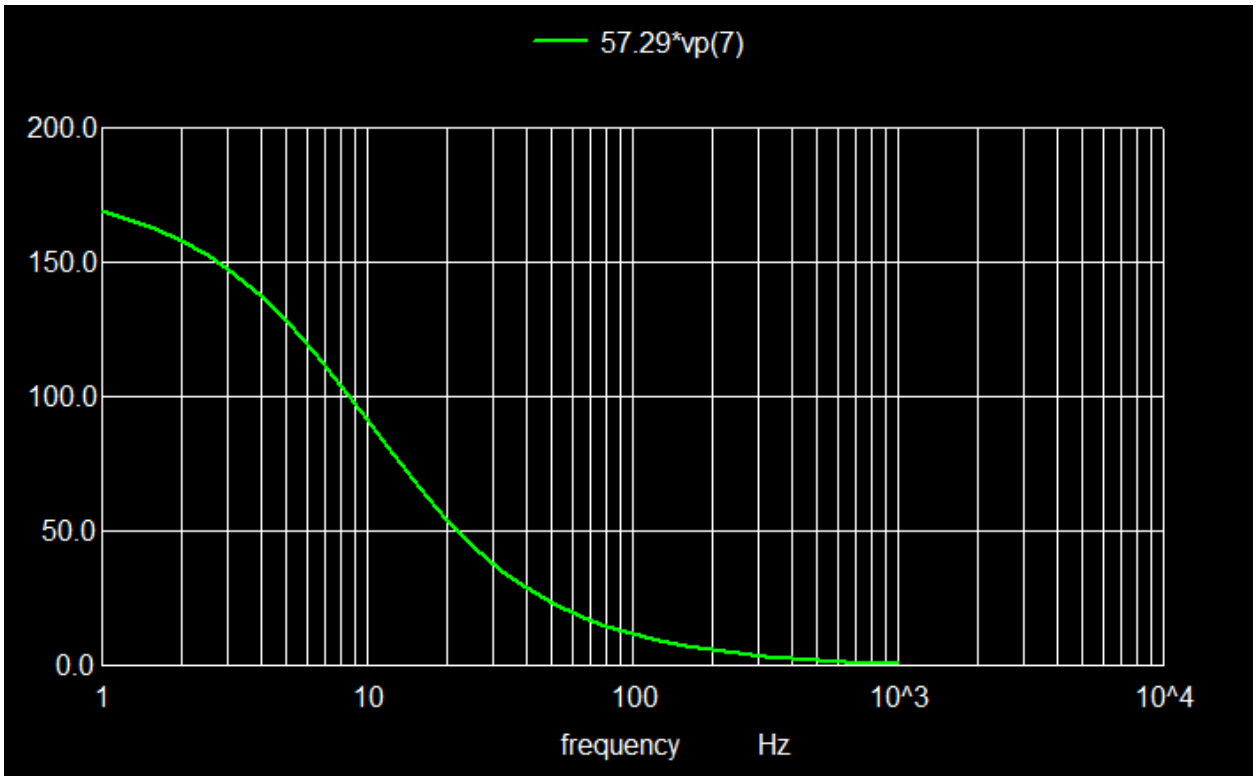
$$= 1050$$

$$\Rightarrow C_{in} = \frac{1}{2\pi R f_L} = \frac{1}{2\pi \times 1050 \times 10} = \frac{1}{21000\pi}$$

$$= 1.52 \times 10^{-5}$$

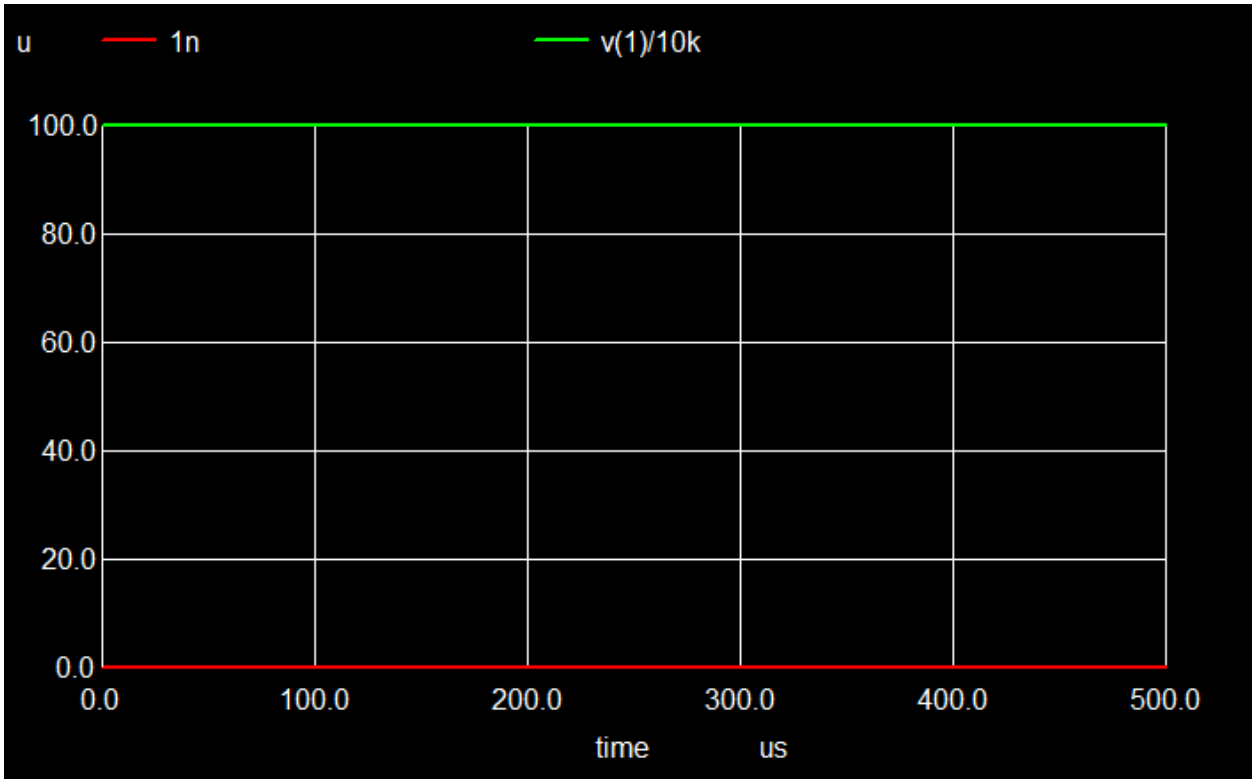
$$= \boxed{1.52E-5F}$$


ac5: *question 4
dB
vdb(7)
30.0
20.0
10.0
0.0
-10.0
-20.0
1
10
100
10^3
10^4
frequency
Hz




```
*Q6a
.include ua741.txt
*Element instantiation


vcc 4 0 dc 15
vdd 5 0 dc -15


r1 1 2 1Meg
r2 2 6 1Meg
r3 3 6 1Meg
r4 3 0 1Meg
rload 2 0 10k
vin 1 0 1


x1 2 3 4 5 6 UA741

.tran 0.02ms 0.5ms
.control
```

run
plot v(1)/10k 1n
.endc
.end



*Q6b
.include ua741.txt
*Element instantiation

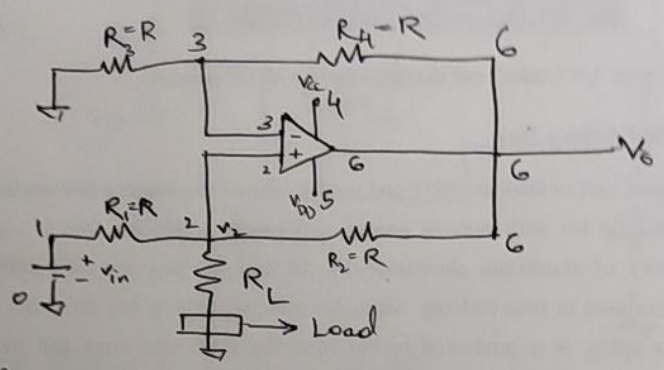
vcc 4 0 dc 15
vdd 5 0 dc -15

r1 1 2 1Meg
r2 2 6 1Meg
r3 3 6 1Meg
r4 3 0 1Meg
rload 2 0 100
vin 1 0 1

x1 2 3 4 5 6 UA741

```
.tran 0.02ms 0.5ms
.control
run
plot v(1)/100 1n
.endc
.end
```

(Q6)



i_L :- Ranges from 10^{-7} to 10^{-5} μA

Since all R are same: $V_o = 2V_2$

$$10^{-7} < \frac{V_{in}}{R} < 10^{-5}$$

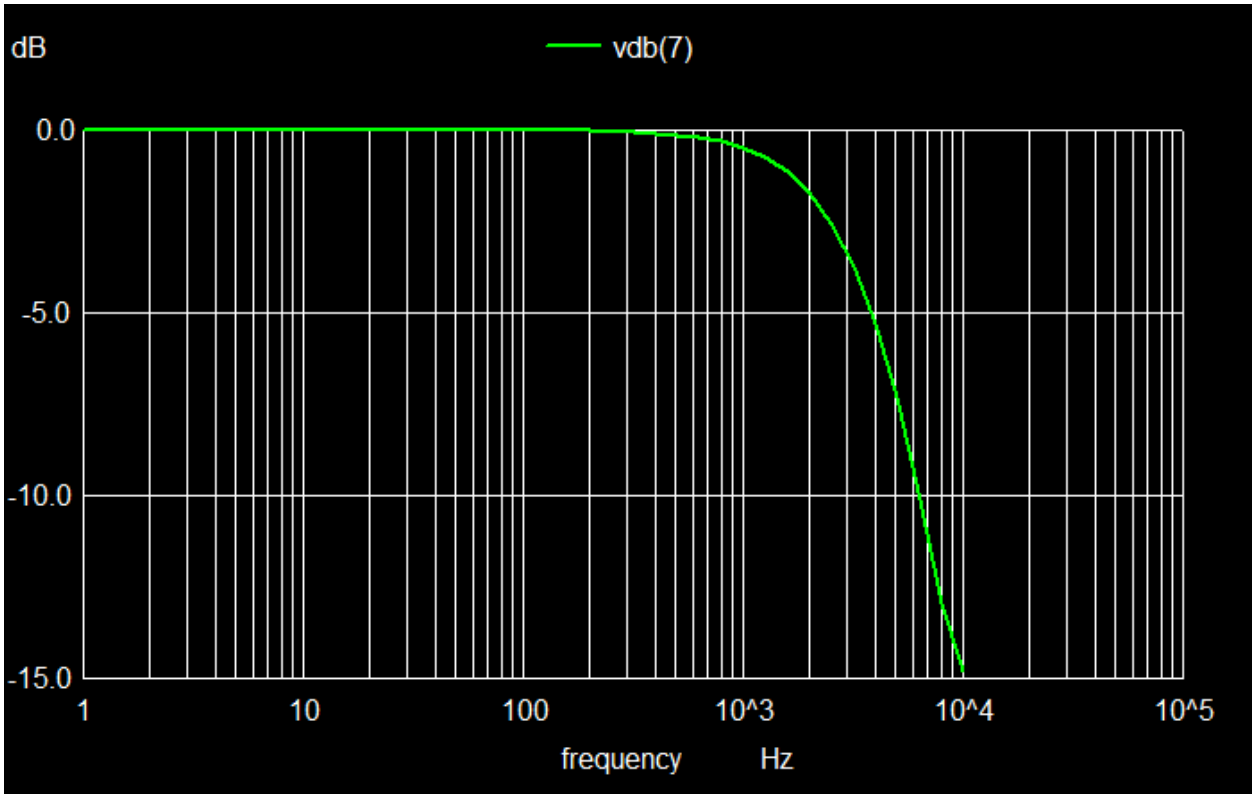
in data-sheet :- $[0.1 < V_{in} < 10]$

$$R = 10^6\ \Omega$$

R_L ranges from 100 Ω to 10K Ω

ACCORDING TO THE PLOTS; whether Load is 10K or 100 Ω; i_L remains same

```
*Q5
.include ua741.txt
Vin 1 0 dc 0 ac 1
X1 2 3 8 9 3 UA741
X2 5 6 8 9 6 UA741
X3 0 4 8 9 7 UA741
Vcc 8 0 DC 15V
Vdd 9 0 DC -15V
C1 1 2 0.01u
C2 0 5 0.01u
R1 2 0 500
R2 1 5 5k
R3 4 6 1Meg
R4 4 3 1Meg
R5 7 4 1Meg
.ac dec 10 1 10k
.control
run
plot vdb(7)
.endc
.end
```


dB
vdb(7)
0.0
-5.0
-10.0
-15.0
1
10
100
10^3
10^4
10^5
frequency
Hz