Linear Integrated Circuits

ECE-3013

TASK-1

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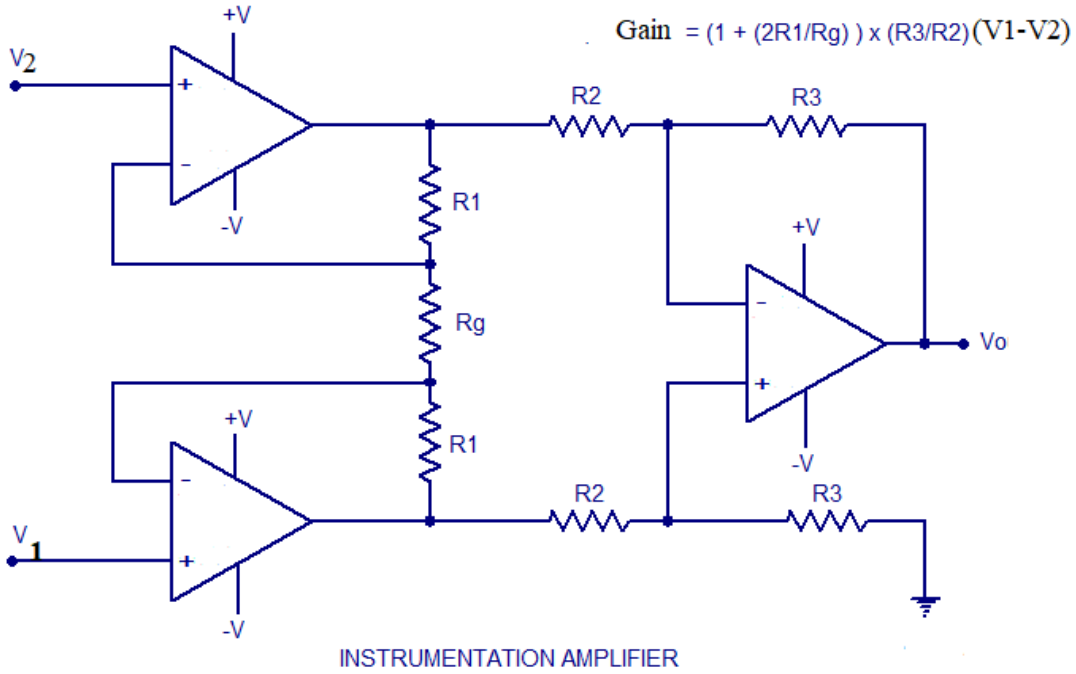
SLOT-L45-46

Question Statement

Design the instrumentation amplifier circuit for a gain of 5, 10, 80.

Let R1=R2=R3=10 KΩ

Let V 1 =2.5V and V 2 =1 V



INSTRUMENTATION AMPLIFIER

Formula :

$$V_O = \frac{R_2}{R_1}\left(1 + \frac{2R_S}{R_G}\right)(V_A - V_B)$$

~~APPLIED~~

$$R_2 = R_1 = R_S = 10k$$

So

$$V_O = \left(1 + \frac{2(10)}{R_G}\right)(V_A - V_S)$$

$$A = 1 + \frac{2(10)}{R_G}$$

CALCULATIONS

Case-1 $A = 5$

$$5 = 1 + \frac{2(10)}{R_G}$$

$$R_G = 5$$

Case-2

$$10 = 1 + \frac{2(10)}{R_G}$$

$$9 = +\frac{20}{R_G} \quad = R_G = \frac{20}{9} = 2.2\ \Omega.$$

case -3

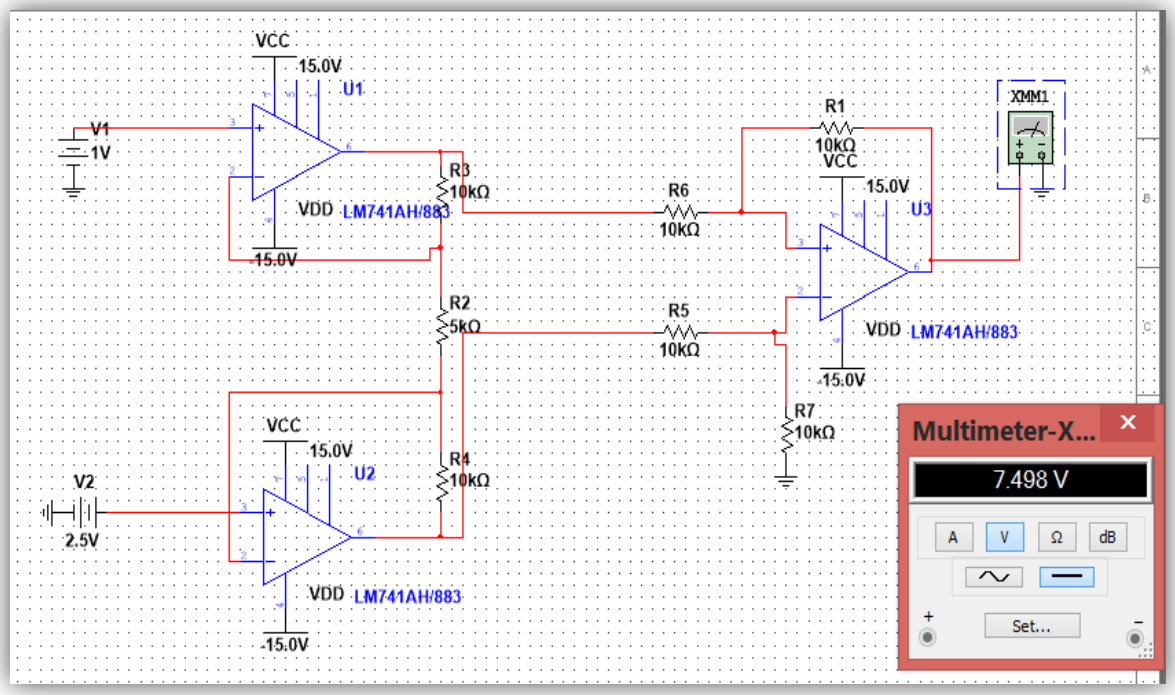
$$1 + \frac{20}{R_a} = 80$$

$$\frac{20}{79} \approx 253\ \Omega\ [R_a]$$

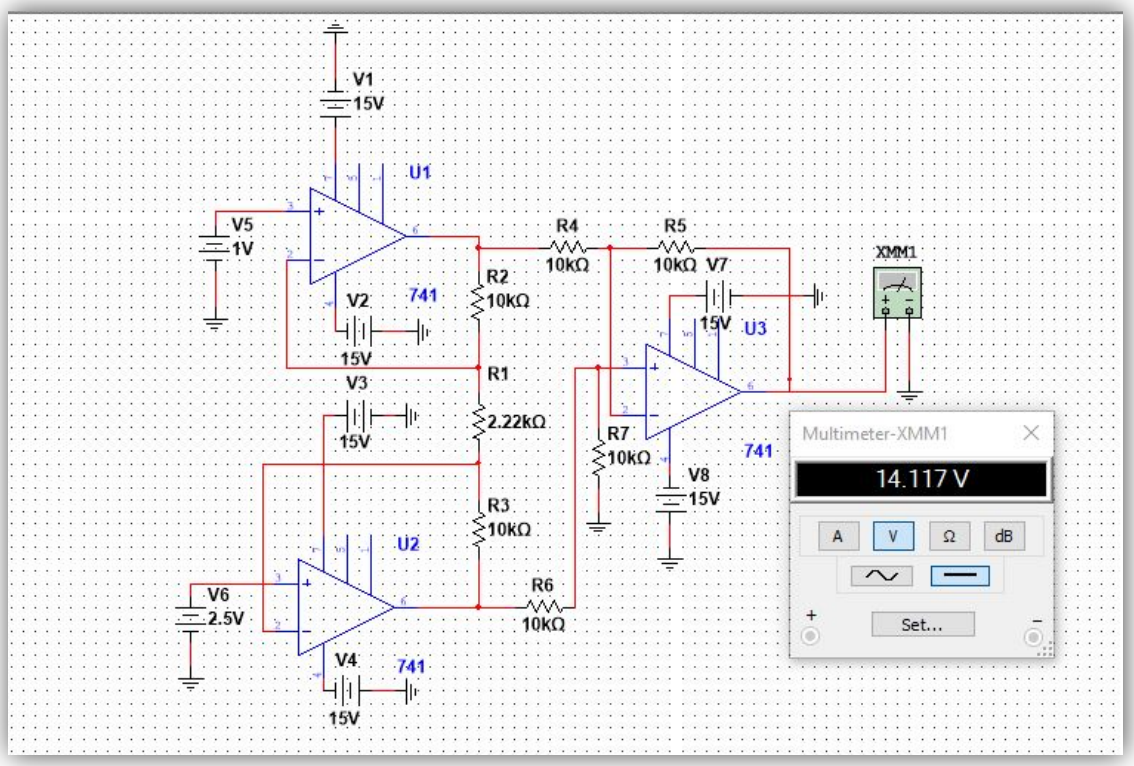
RESULT : Even though the gain A=80, the V_o cannot exceed ±5 V due to the biasing voltage of the op-Amp (LM741)

MULTISIM SIMULATIONS:

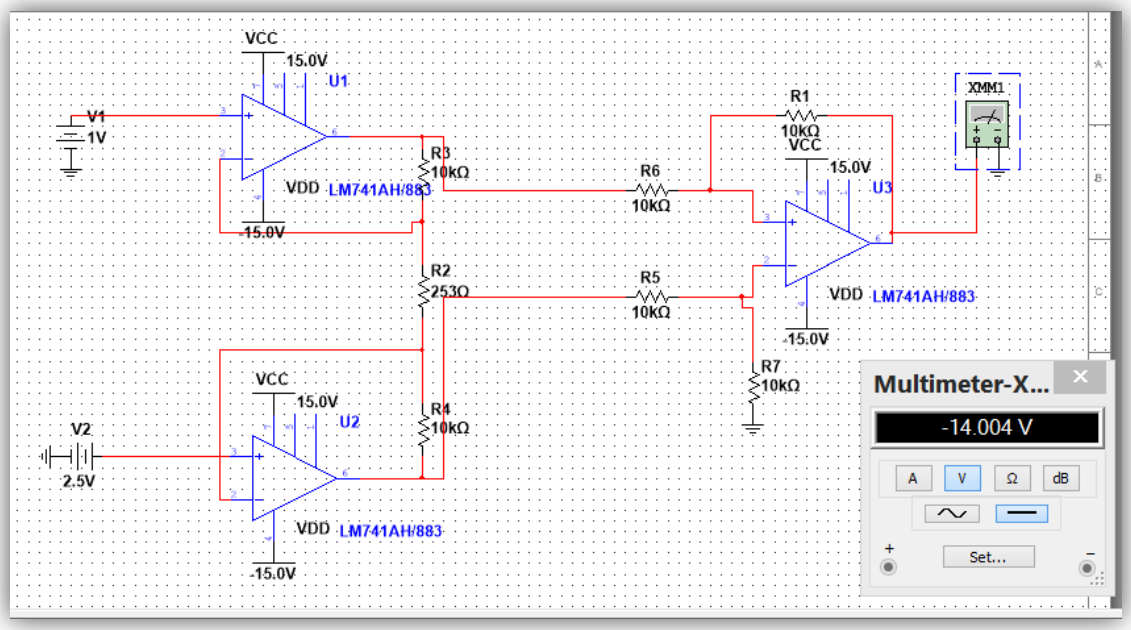
1) When gain A=5



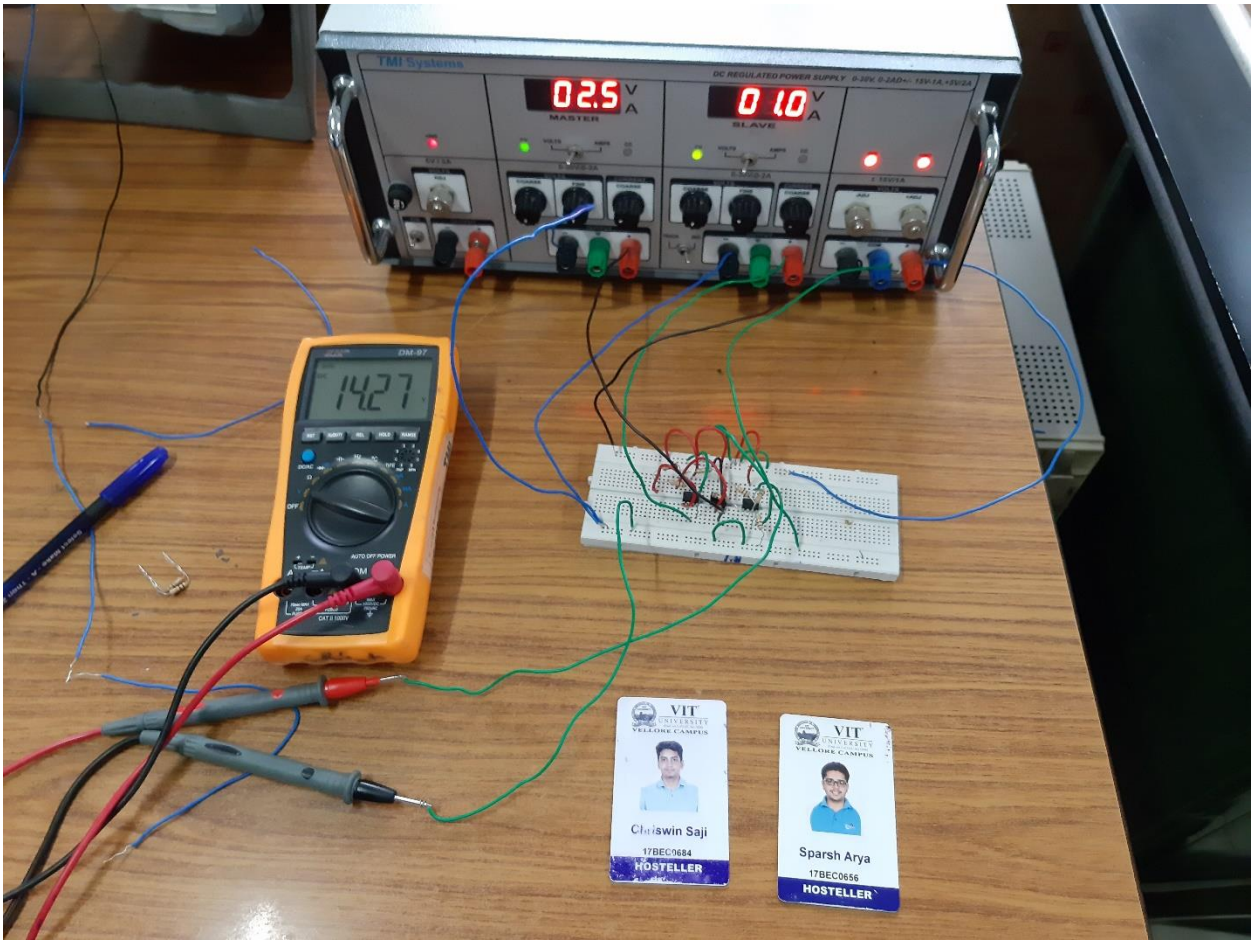
2) When gain A=10

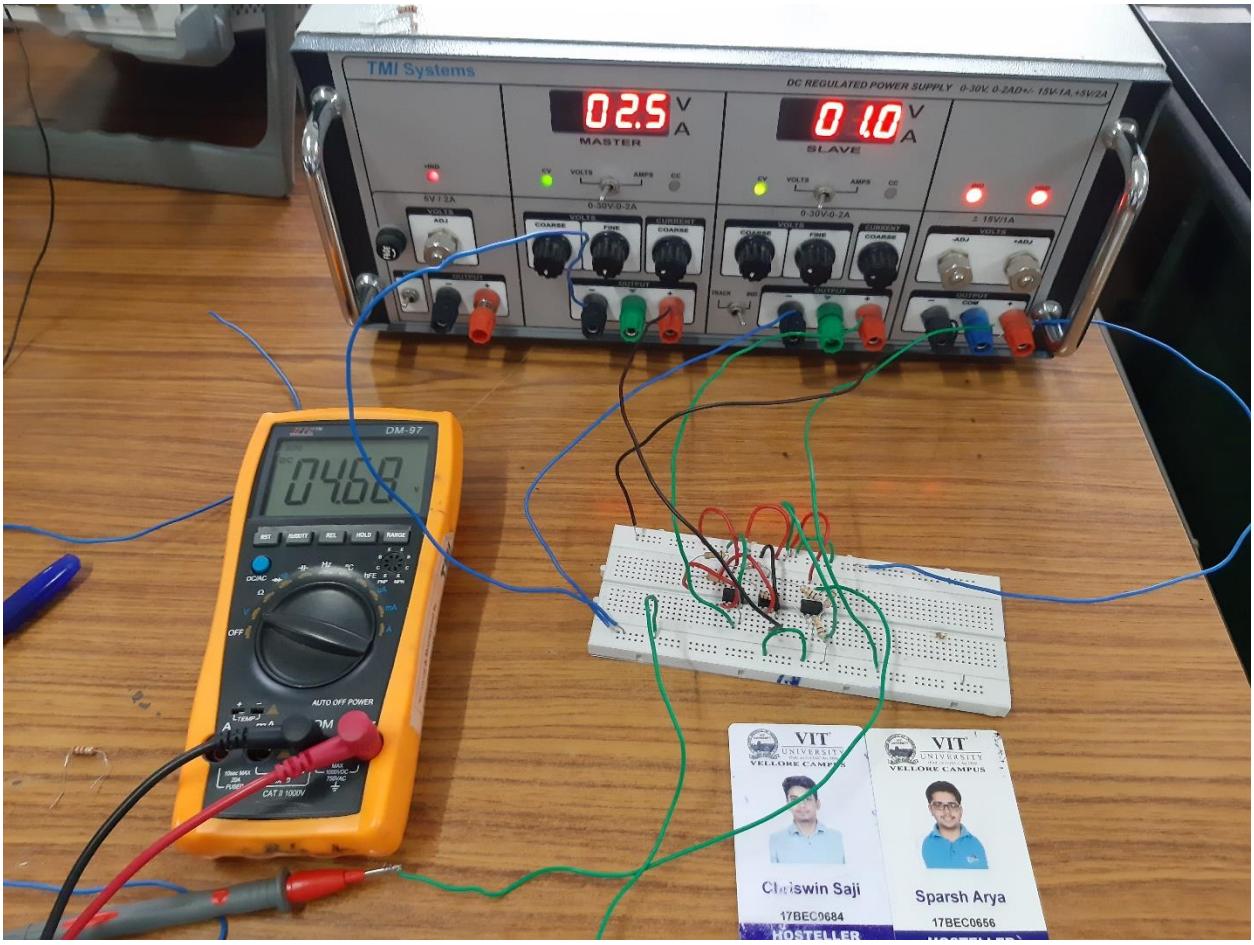

V1
15V
U1
V5
1V
R4
10kΩ
R5
10kΩ
V7
15V
U3
XMM1
R2
10kΩ
V2
741
15V
R1
V3
15V
2.22kΩ
R7
10kΩ
741
V8
15V
Multimeter-XMM1
14.117 V
A
V
Ω
dB
Set...
R3
10kΩ
U2
V6
2.5V
R6
10kΩ
V4
741
15V

3) When gain A=80



Practical Output Screenshots


TMI Systems
02.5
MASTER
0 1.0
SLAVE
1427
VIT
VELLORE CAMPUS
Chriswin Saji
17BEC0684
HOSTELLER
VIT
VELLORE CAMPUS
Sparsh Arya
17BEC0656
HOSTELLER



(with 10 k as Rg)