Problem No. 10

Name: An op-amp Multivibrator circuit is constructed using the following components:

R1= 30KΩ, R2 = 26kΩ For Last digit of Student ID- 6,7,8,9

(a) R = 50kΩ and C = 0.01uF. Calculate the circuit's frequency of oscillation.

Draw and simulate the circuit in PSPICE and compare with the calculated

frequency.

Calculation:

VUT = (R2/R1+R2) (+ VSAT) = 7v

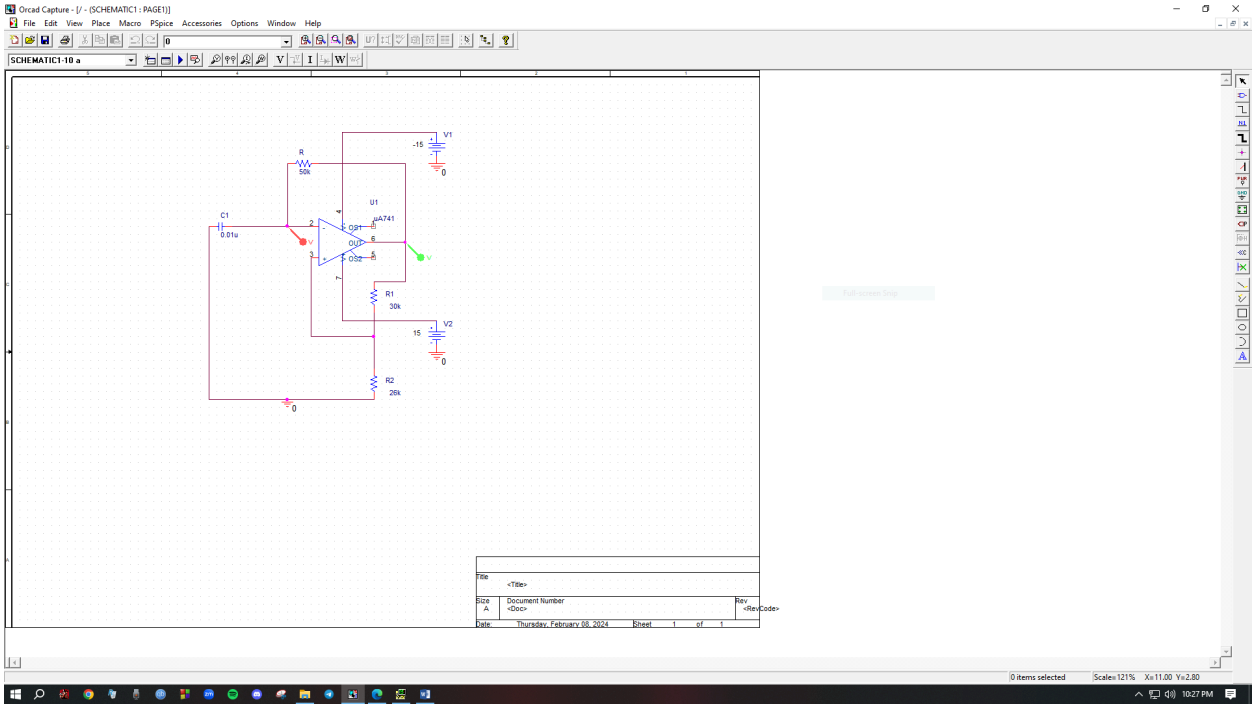
VLT = (R2/R1+R2) (− VSAT)= -7v

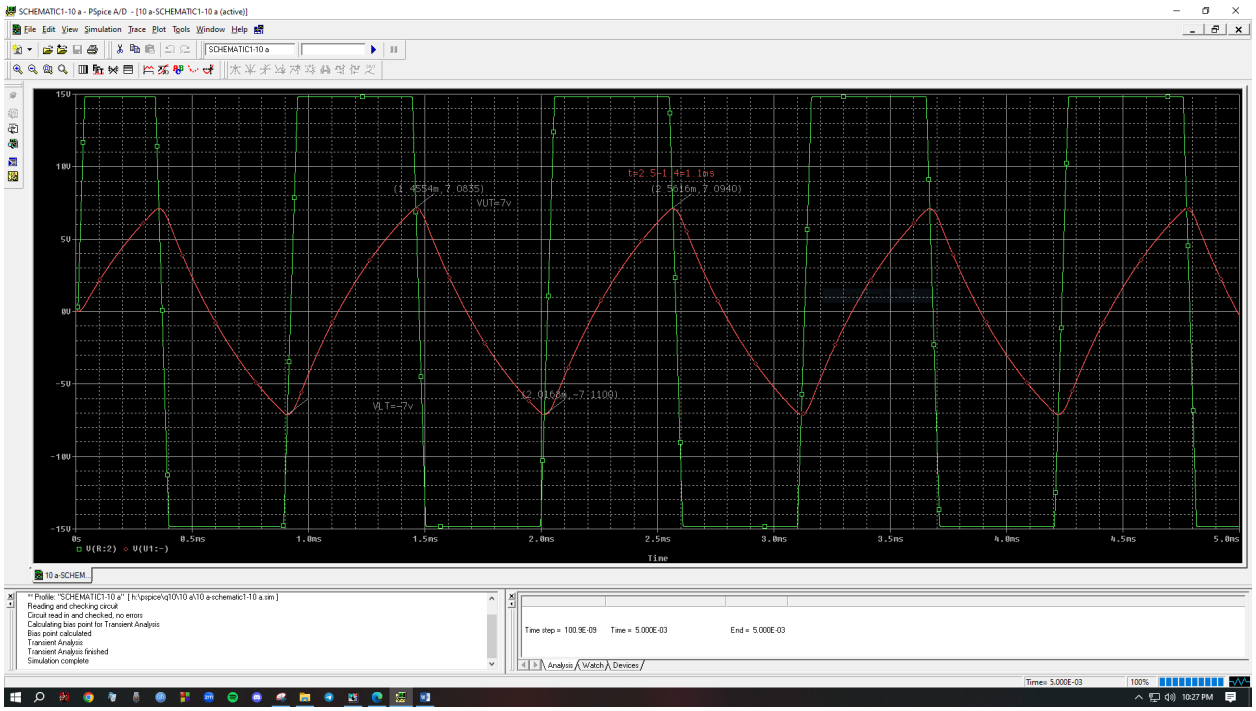
ton or toff= RC = 50k x 0.01u= 0.5ms

so T=1ms

f= 1/T = 1/0.001= 1000Hz

f= 1k Hz


Orcad Capture - [/ - (SCHEMATIC1 : PAGE1)]
File Edit View Place Macro PSpice Accessories Options Window Help
SCHEMATIC1-10 a
V1
-15
R
50k
U1
uA741
C1
0.01u
R1
30k
V2
15
R2
26k
Title
<Title>
Size
A
Document Number
<Doc>
Rev
<RevCode>
Date:
Thursday, February 08, 2024
Sheet
1
of
1
0 items selected
Scale= 121%
X= 11.00
Y= 2.80
10:27 PM


SCHEMATIC1-10 a - PSpice A/D - [10 a-SCHEMATIC1-10 a (active)]
File Edit View Simulation Trace Plot Tools Window Help
SCHEMATIC1-10 a
15V
10V
5V
0V
-5V
-10V
-15V
0s
0.5ms
1.0ms
1.5ms
2.0ms
2.5ms
3.0ms
3.5ms
4.0ms
4.5ms
5.0ms
V(R:2)
V(U1:-)
Time
10 a-SCHEM
** Profile: "SCHEMATIC1-10 a" [h:\pspice\q10\10 a\10 a-schematic1-10 a.sim]
Reading and checking circuit
Circuit read in and checked, no errors
Calculating bias point for Transient Analysis
Bias point calculated
Transient Analysis
Transient Analysis finished
Simulation complete
Time step = 100.9E-09
Time = 5.000E-03
End = 5.000E-03
Analysis
Watch
Devices
Time= 5.000E-03
100%
10:27 PM

(b) What would happen if VLT and VUT are not equal? Design a Multivibrator circuit where VLT is -4V and VUT is 6V.

R1= 30K

R2=26k

VLT= -4 =R3/30k+R3 (− 15)

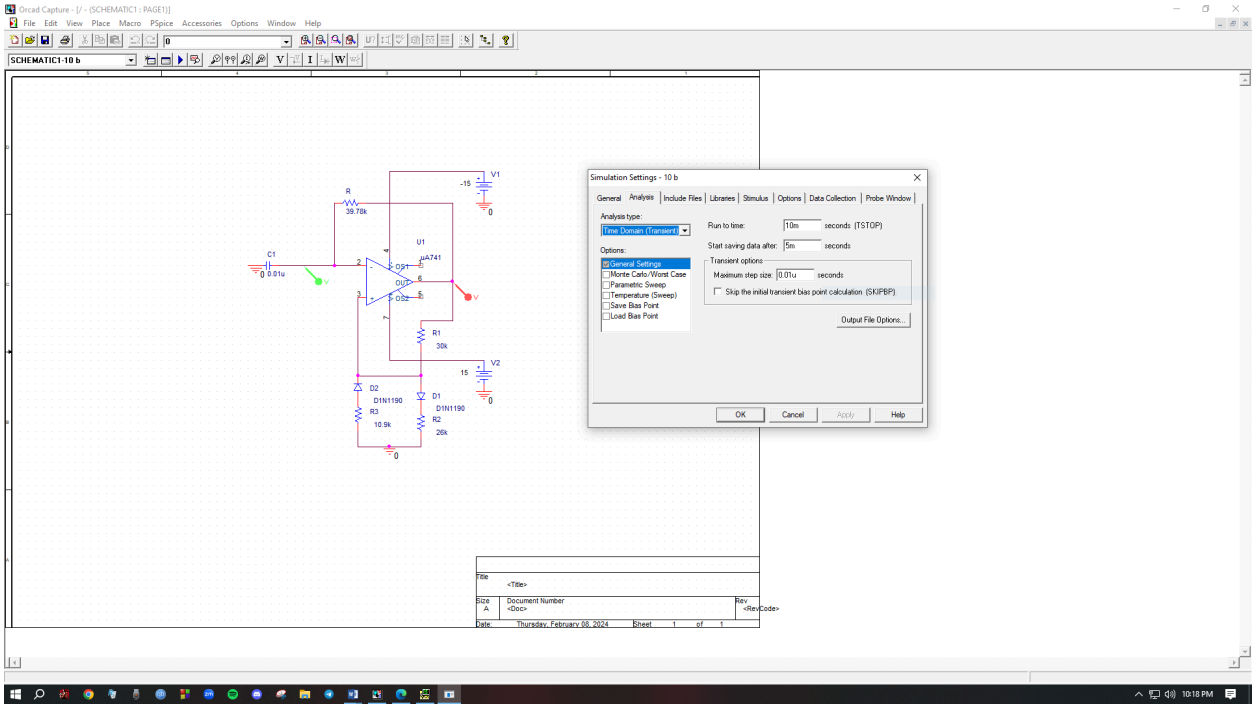
R3= 10.9k

Let, tON= 0.0004s

tON = RC ln (R1+2R2/R1)

so, R= 39.78k

from pspice we get VUT= 5.76v VLT= -3.9v which is almost close to given value


Orcad Capture - [/ - (SCHEMATIC1 : PAGE1)]
File Edit View Place Macro PSpice Accessories Options Window Help
SCHEMATIC1-10 b
R
39.78k
C1
0.01u
U1
uA741
R1
30k
R2
26k
R3
10.9k
D1
D1N1190
D2
D1N1190
V1
-15
V2
15
Simulation Settings - 10 b
General Analysis Include Files Libraries Stimulus Options Data Collection Probe Window
Analysis type:
Time Domain (Transient)
Run to time:
10m
seconds (TSTOP)
Start saving data after:
5m
seconds
Options:
General Settings
Monte Carlo./Worst Case
Parametric Sweep
Temperature (Sweep)
Save Bias Point
Load Bias Point
Transient options
Maximum step size:
0.01u
seconds
Skip the initial transient bias point calculation (SKIPBP)
Output File Options...
OK
Cancel
Apply
Help
Title
<Title>
Size
A
Document Number
<Doc>
Rev
<RevCode>
Date:
Thursday, February 08, 2024
Sheet
1
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1
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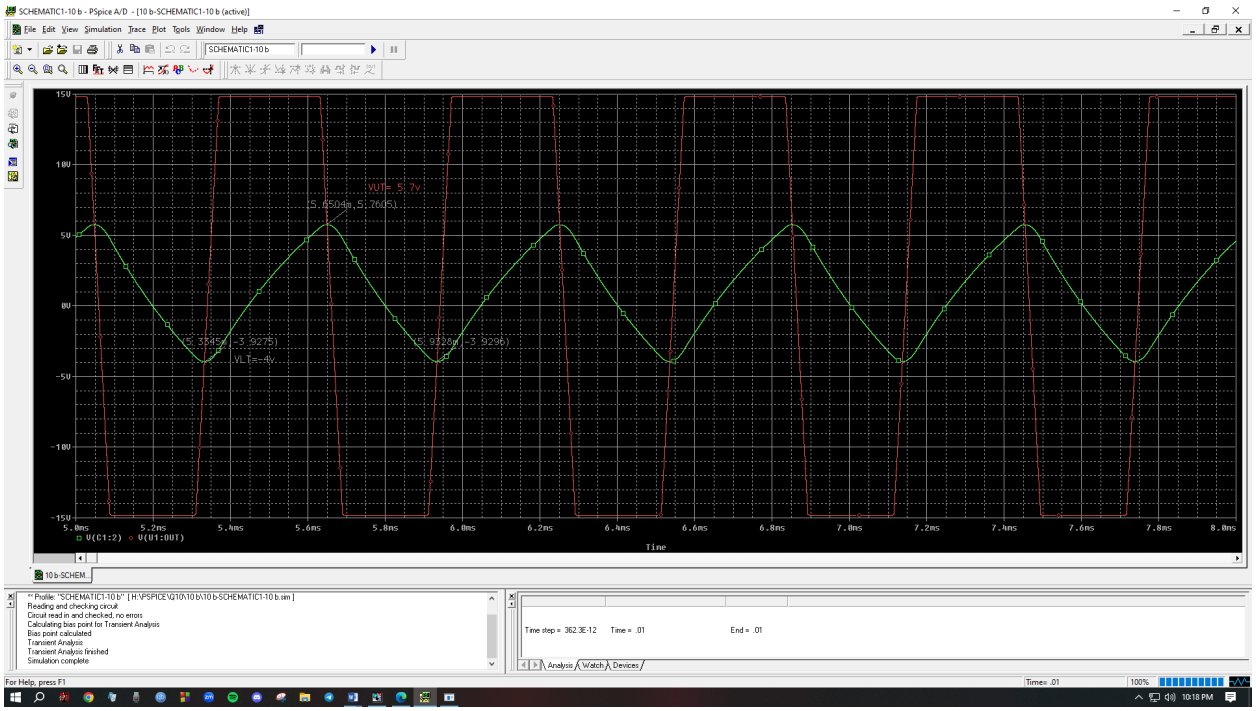
SCHEMATIC1-10 b - PSpice A/D - [10 b-SCHEMATIC1-10 b (active)]
File Edit View Simulation Trace Plot Tools Window Help
SCHEMATIC1-10 b
15V
10V
5V
0V
-5V
-10V
-15V
VUT= 5.7v
(5.6504m,5.7605)
(5.3545m,-3.9275)
VLT=-4v
(5.9728m,-3.9296)
5.0ms
5.2ms
5.4ms
5.6ms
5.8ms
6.0ms
6.2ms
6.4ms
6.6ms
6.8ms
7.0ms
7.2ms
7.4ms
7.6ms
7.8ms
8.0ms
V(C1:2)
V(U1:OUT)
Time
10 b-SCHEM...
** Profile: "SCHEMATIC1-10 b" [H:\PSPICE\Q10\10 b\10 b-SCHEMATIC1-10 b.sim]
Reading and checking circuit
Circuit read in and checked, no errors
Calculating bias point for Transient Analysis
Bias point calculated
Transient Analysis
Transient Analysis finished
Simulation complete
Time step = 362.3E-12
Time = .01
End = .01
Analysis
Watch
Devices
For Help, press F1
Time= .01
100%
10:18 PM