Ex. No.: 10 Date: 20/12/2021

Verification of Step-Up and Step-Down Transformer

Aim:

To simulate the Transformer on step down and step-up mode using OrCAD capture CIS and find the input and output voltage both simulation and analytical calculation.

Apparatus:

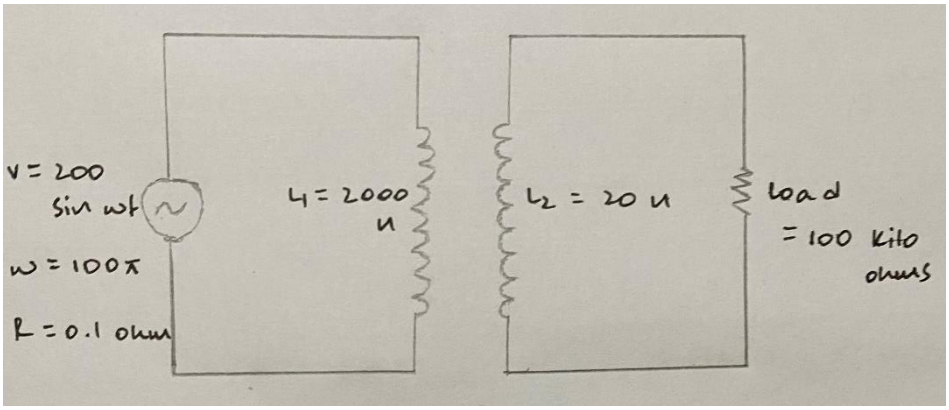
ORCAD / Capture CIS: Analog Library – R

Design Cache – VSIN, XFRM_LINEAR

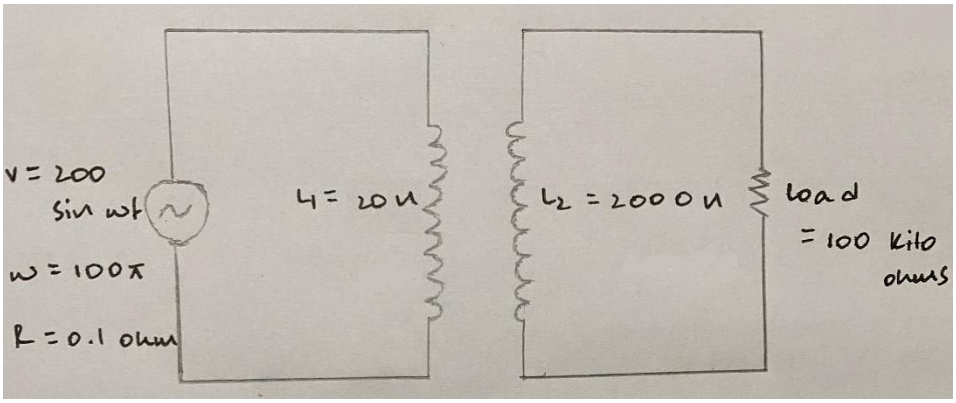
Ground (GND) – 0 (zero)

Simulation Settings: Analysis Type – Time Domain (Transient)

Circuit Diagram for Step-Down Transformer:



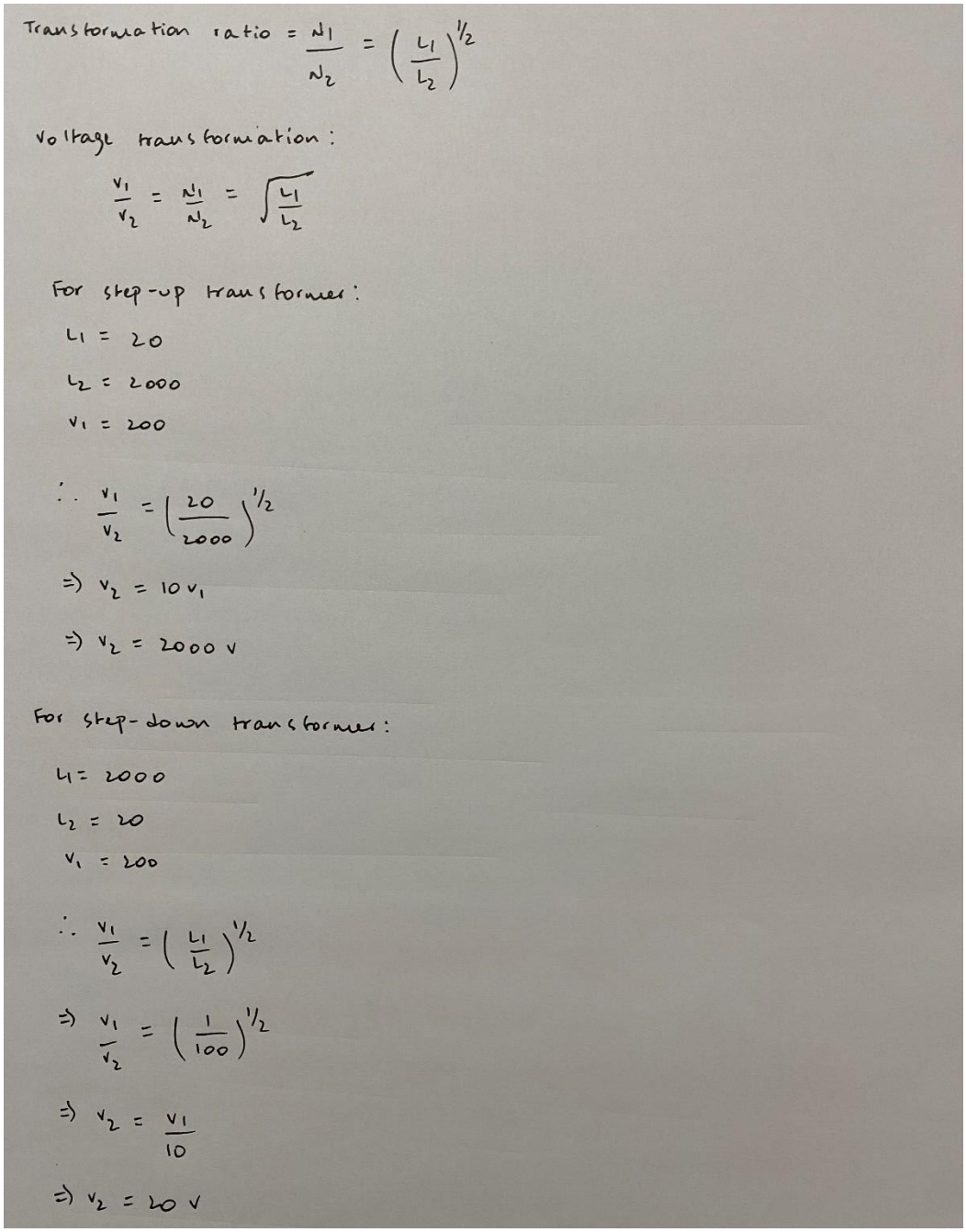
Circuit Diagram for Step-Up Transformer:



Statement:

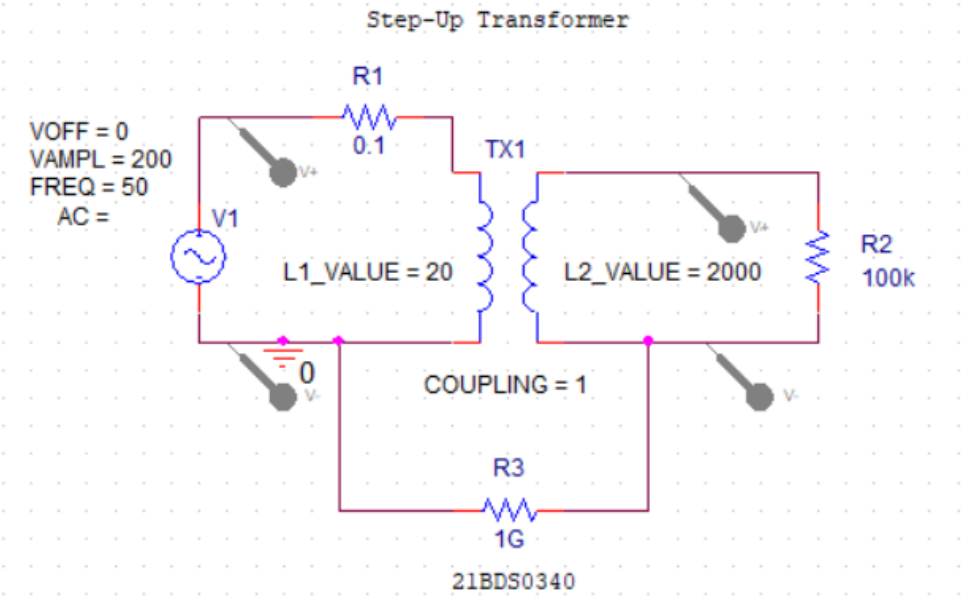
A transformer is a machine that works by changing the output voltage by manipulating the input voltage using inductors. A step-up voltage increases the voltage while a step-down voltage decreases the voltage.

Analytic Calculation:

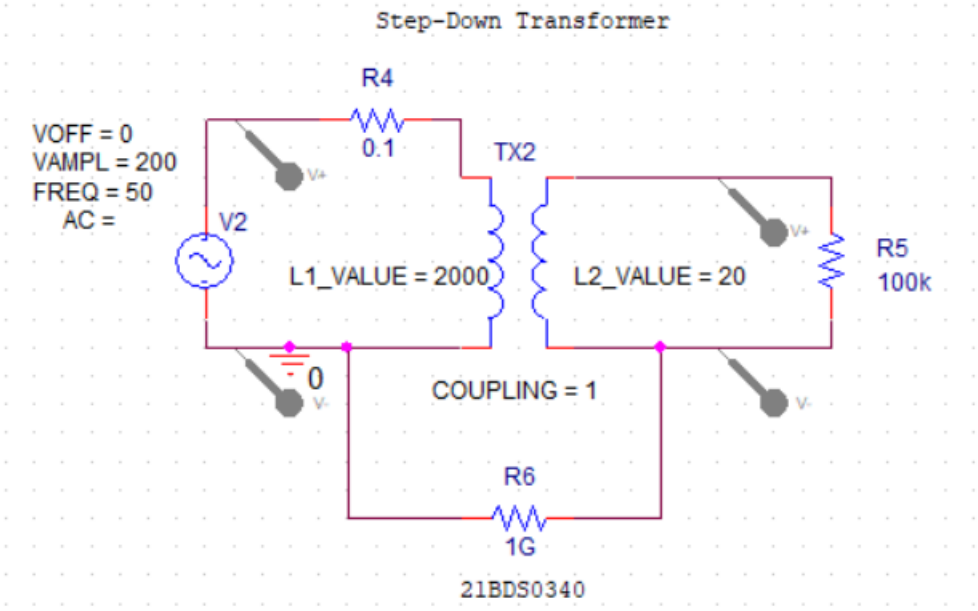


Simulation Circuit:

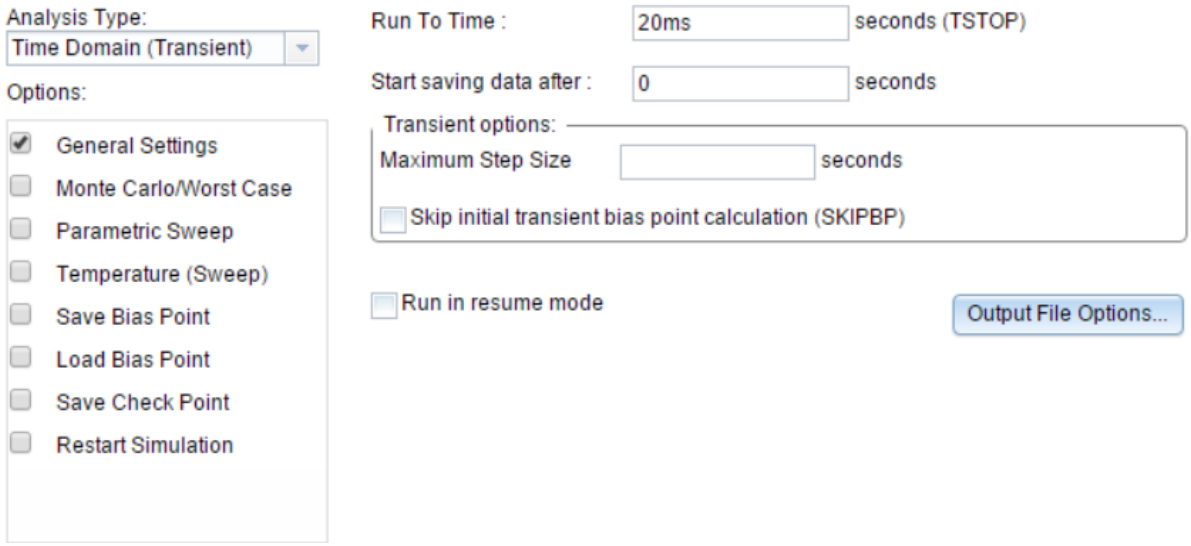
Step-Up Transformer:



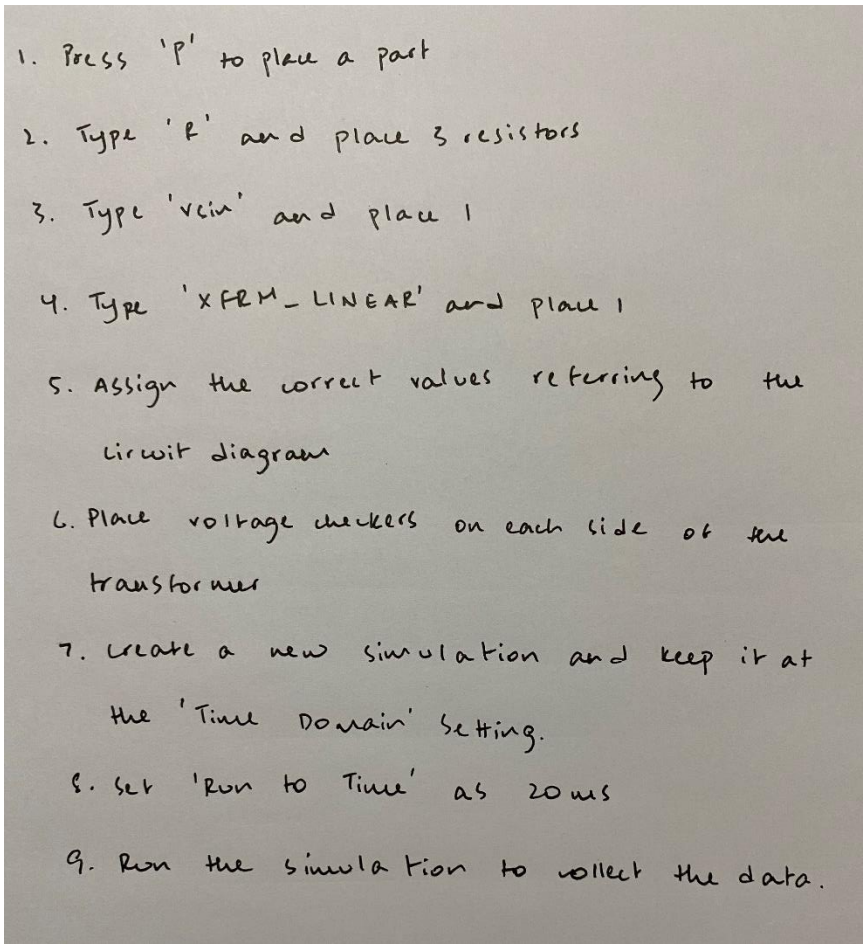
Step-Down Transformer:



Simulation Profile Settings:



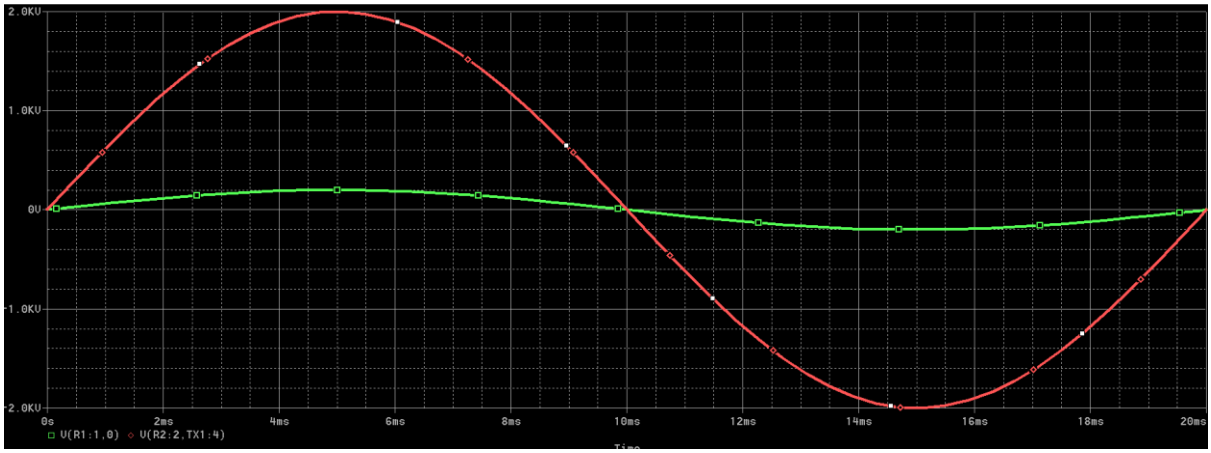
Procedure:



1. Press 'P' to place a part
2. Type 'R' and place 3 resistors
3. Type 'vcin' and place 1
4. Type 'XFRM_LINEAR' and place 1
5. Assign the correct values referring to the circuit diagram
6. Place voltage checkers on each side of the transformer
7. Create a new simulation and keep it at the 'Time Domain' setting.
8. Set 'Run to Time' as 20 ms
9. Run the simulation to collect the data.

Result:

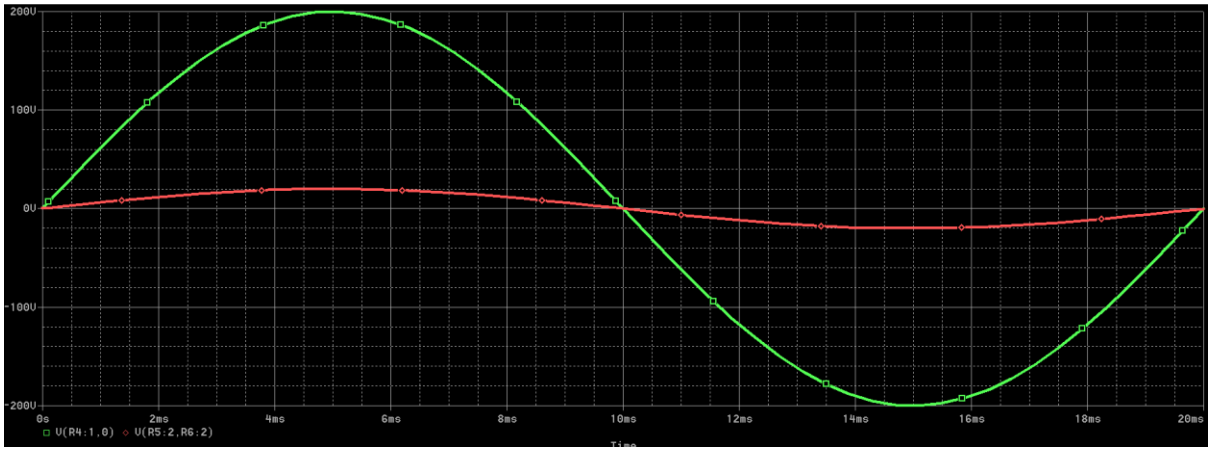
Step-Up Transformer Graph:



Red line – output voltage, **2000V**

Green line – input voltage, **200V**

Step-Down Transformer Graph:



Red line – output voltage, **20V**

Green line – input voltage, **200V**

Transformer Output

NOTATION	MANUAL CALCULATIONS	SIMULATED RESULT
STEP-DOWN OUTPUT VOLTAGE	20	20
STEP-UP OUTPUT VOLTAGE	2000	2000

Inference:

By the manual calculations and the simulation circuit, both answers are coming the same. Therefore, the transformer works as expected.

Reg. No: 21BDS0340	Name: Abhinav Dinesh Srivatsa	Date: 20/12/2021