Objective:

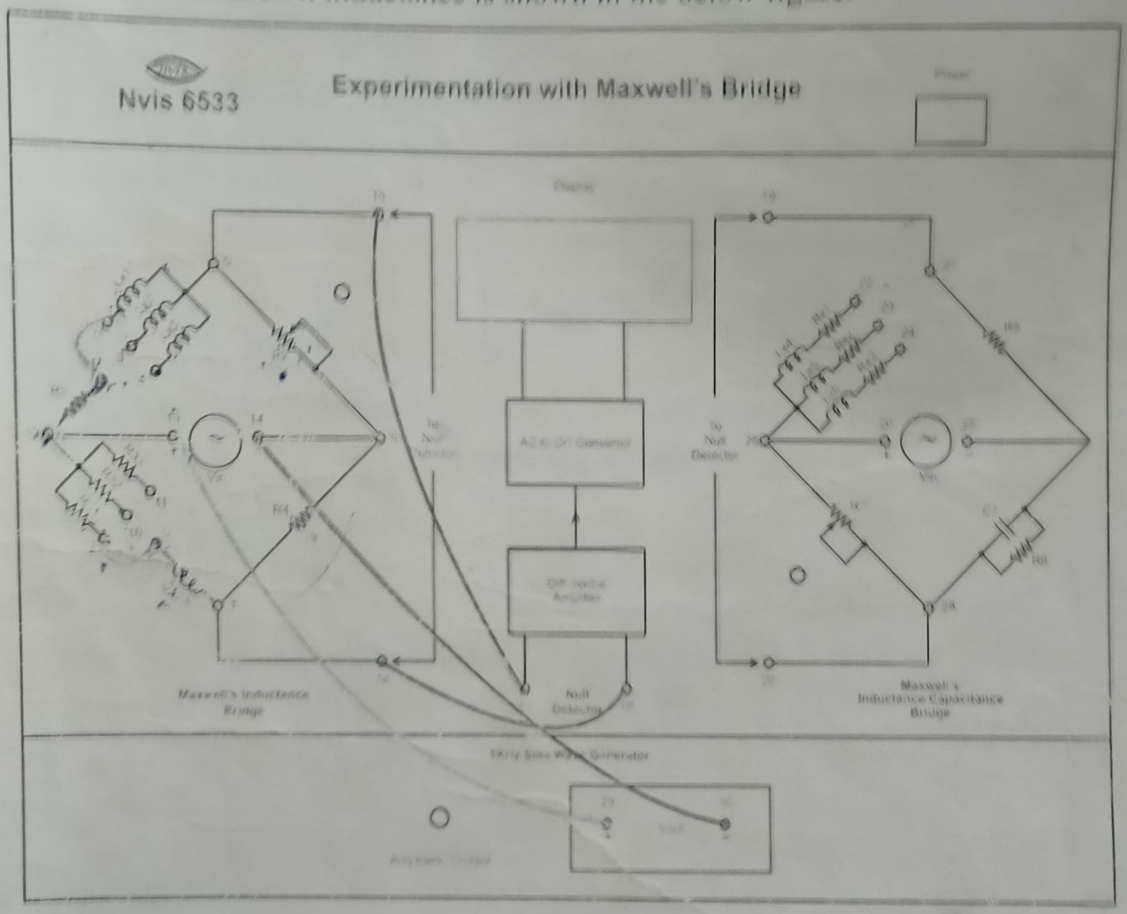
Determination of unknown inductance using Maxwell's inductance bridge method

Equipments Needed:

1. Nvis 6533
2. 2 mm patch cords
3. Digital multimeter
4. Oscilloscope

Circuit diagram:

Mimic illustration with connections for Maxwell's inductance bridge method for measurement of unknown inductance is shown in the below figure.



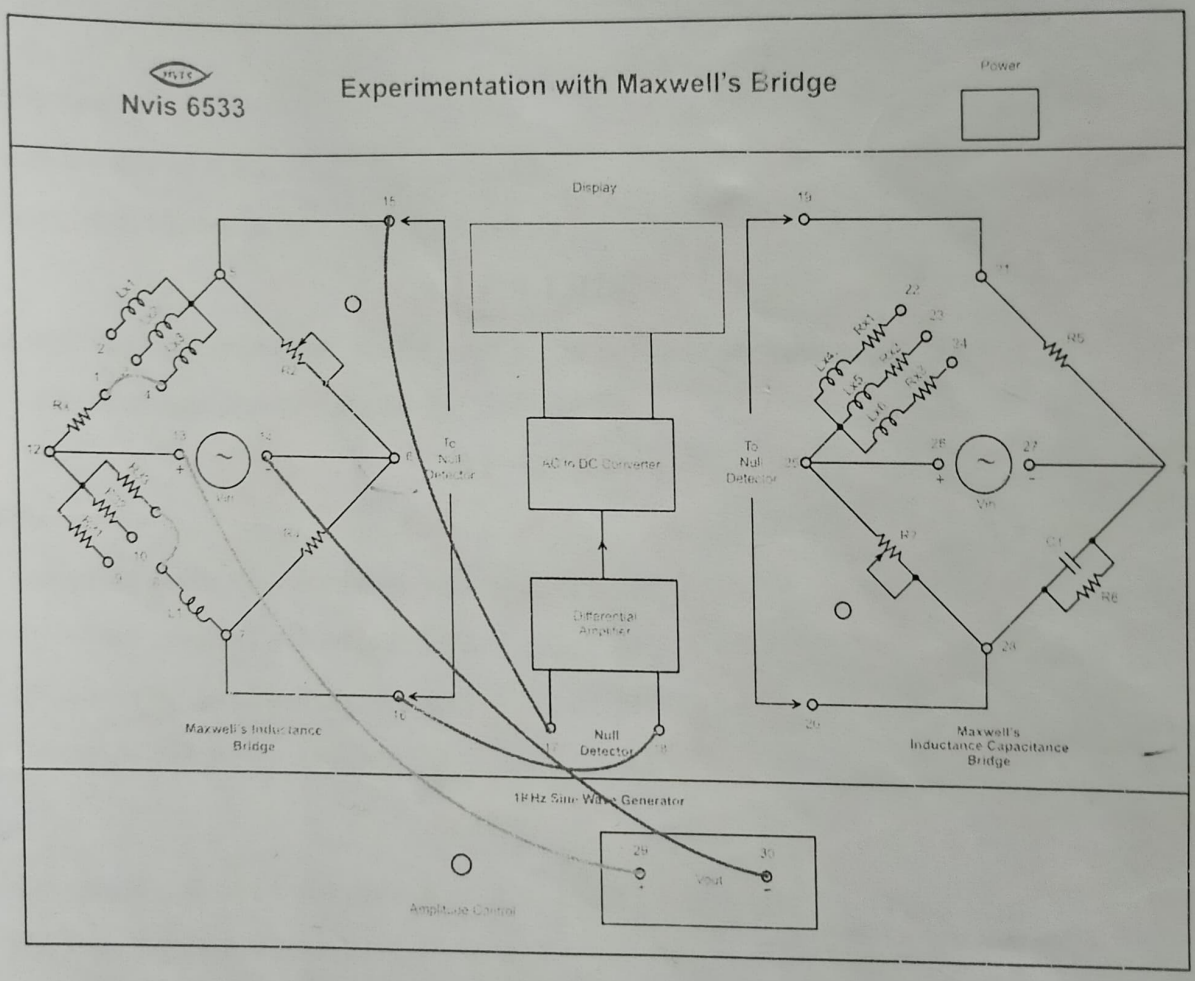
Procedure:

1. Connect a patch cord between socket '13' of Vin terminals of Maxwell's inductance bridge and socket '29' of Vout terminals of the 1 KHz sine wave generator.

Observation Table 2:

R2 Ω	R4 Ω	R3= R32 Ω	L1 µH	Lx2 =L1.R2/R4 µH	Rx = R2.R3/R4 Ω

20. Now connect a patch cord between sockets '1' and '4' and another patch cord between sockets '8' and '11' as shown in below figure to determine the value of Lx3 and Rx3.



21. Now repeat the above procedure from step 6 to 9.

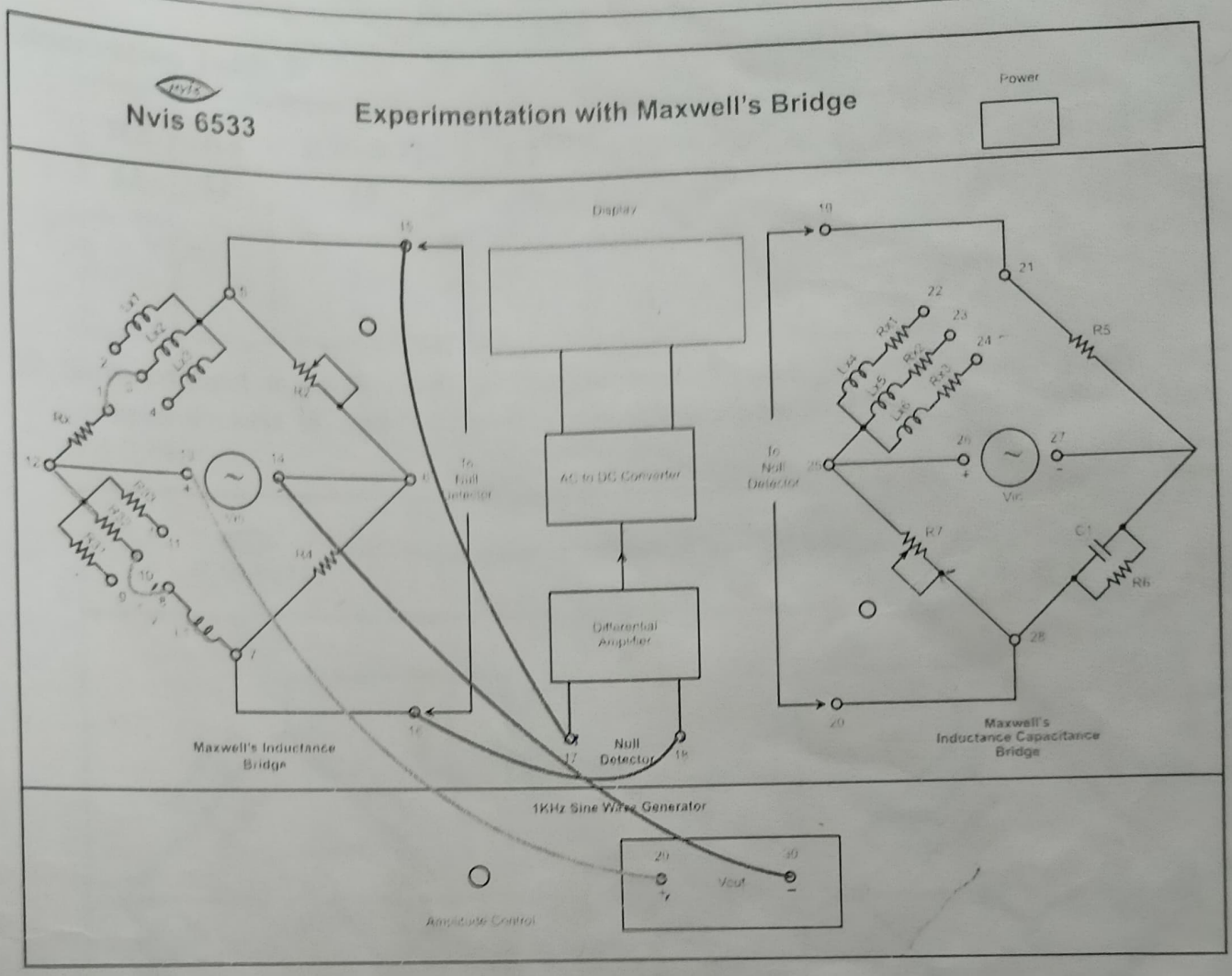
22. Remove all the patch cords connected to bridge circuit for accurate reading of R2.

23. Now Measure the resistance R2 between test-points '5' and '6' using a digital multimeter.

24. Calculate the value of inductance Lx3 and resistance Rx using the formula

$$Lx = L1.R2/R4$$

Where, Lx=Lx3, L1= 12µH, R4=100Ω



15. Repeat the above procedure from step 6 to 9.

16. Remove all the patch cords connected to bridge circuit for accurate reading of R2.

17. Now measure the value of resistance R2 between test-points '5' and '6' using a digital multimeter.

18. Calculate the value of inductance Lx2 and resistance Rx using the formula

$$Lx = L1.R2/R4$$

Where, Lx=Lx2, L1= 12μH, R4=100Ω

19. Calculate the value of unknown resistance using the formula

$$Rx = R2.R3/R4.$$

Where, R3=237Ω, R4=100Ω

2. Connect a patch cord between socket '14' of Vin terminals of Maxwell's inductance bridge and socket '30' of Vout of the 1 KHz sine wave generator.
3. Connect a patch cord between sockets '1' and '2' and connect another patch cord between sockets '8' and '9' to determine the value of Lx1 and Rx1.
4. Connect patch cords between sockets '15' and '17' and sockets '16' and '18' for the purpose of null detection.
5. Set the potentiometer R2 in counter clockwise direction.
6. Switch 'On' the power supply.
7. Set the amplitude of 1 KHz sine wave generator maximum i.e. rotate amplitude control knob fully clockwise.
8. Rotate the potentiometer R2 towards clockwise direction very precisely to find a condition where null (Zero or minimum reading) is displayed on DPM.
9. Switch 'Off' the power supply.
10. Remove all the patch cords connected to bridge circuit for accurate reading of R2.
11. Now measure the resistance R2 between test-points '5' and '6' using a digital multimeter.
12. Calculate the value of inductance Lx1 and resistance Rx using the formula

$$Lx = L1.R2/R4$$

Where, Lx=Lx1, L1= 12μH, R4=100Ω

13. Calculate the value of unknown resistance using the formula

$$Rx = R2.R3/R4.$$

Where, R3=120Ω, R4=100Ω

Observation Table 1:

R2 Ω	R4 Ω	R3= R3 Ω	L1 μH	Lx1 =L1.R2/R4 μH	Rx = R2.R3/R4 Ω

14. Now again connect a patch cord between sockets '1' and '3' and another patch cord between sockets '8' and '10' as shown in below figure to determine the value of Lx2 and Rx2.

25. Calculate the value of unknown resistance using the formula

$$Rx = R2.R3/ R4$$

Where, R3=470Ω, R4=100Ω

Observation Table 3:

R2 Ω	R4 Ω	R3= R3∥ Ω	L1 µH	Lx3 =L1.R2/R4 µH	Rx = R2.R3/R4 Ω

Calculation:

Measured value of R2 is. .....Ω.

Now calculate the value of Lx by the formula

$$Lx = L1.R2/R4$$

Measured value of resistance Rx by multimeter between sockets .....Ω.

Now calculate the values of Rx by the formula

$$Rx = R2.R3/R4$$

Result:

The unknown value of inductance Lx1 = ...µH.

The unknown value of inductance Lx2 = ...µH.

The unknown value of inductance Lx3 = ...µH.

The unknown value of resistance Rx = ...Ω.

Note:

1. The actual values of inductors Lx1, Lx2 and Lx3 are 56µH, 24µH and 12µH.
2. The actual value of resistor Rx is 470 Ω.
3. Calculated R_X is (Rx + r), where r is internal resistance of corresponding inductor.
4. Small amount of error would be there due to component tolerance and also due to human error.