Date: 02/08/2021 Exp. 1 Study of Measuring, Testing, Power Supply Instruments and Bread Board

TASK 1

Aim: To simulate the circuits and find voltages across resistors and currents through the source and resistances.

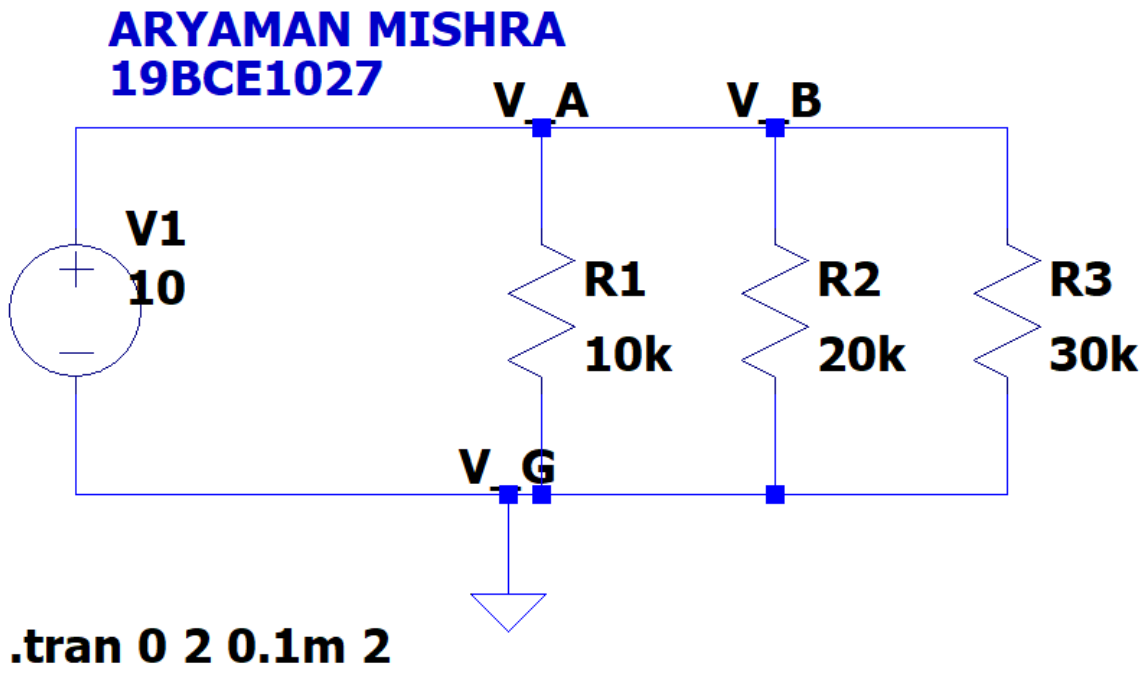
Software/Hardware Components used: LTSpice, 3 Resistors, 1 Voltmeter, Ground, Wire

Expression:

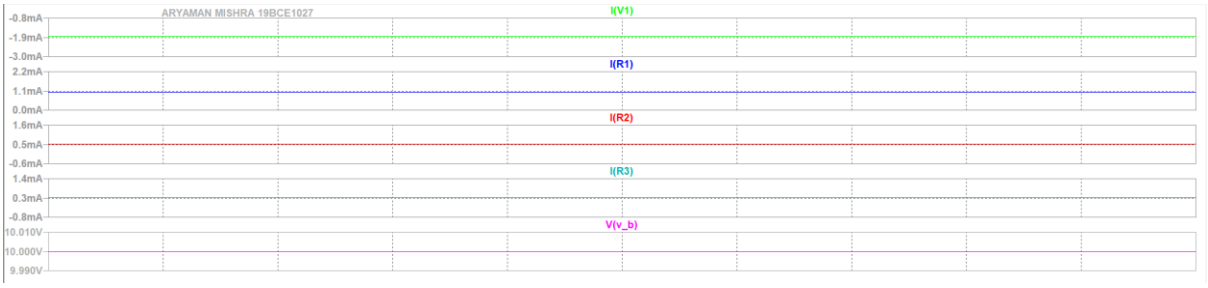
Voltage (V) = Current (I) *Resistance (R)

Circuits and Plots:

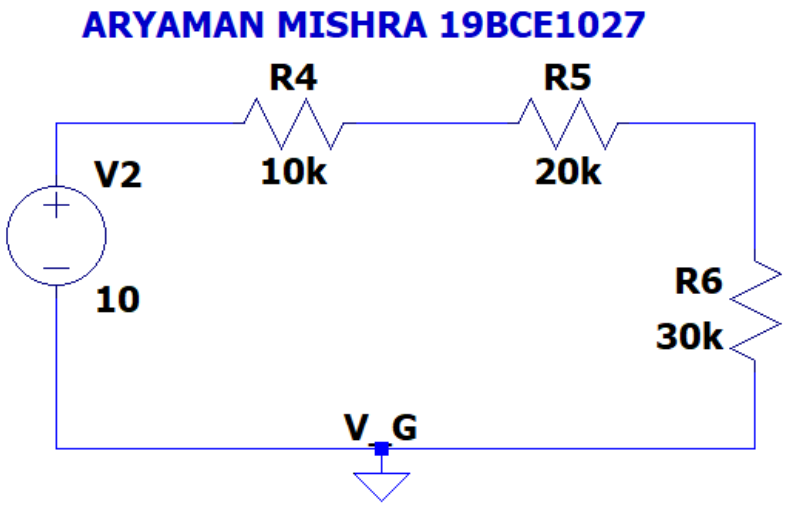
Circuit 1



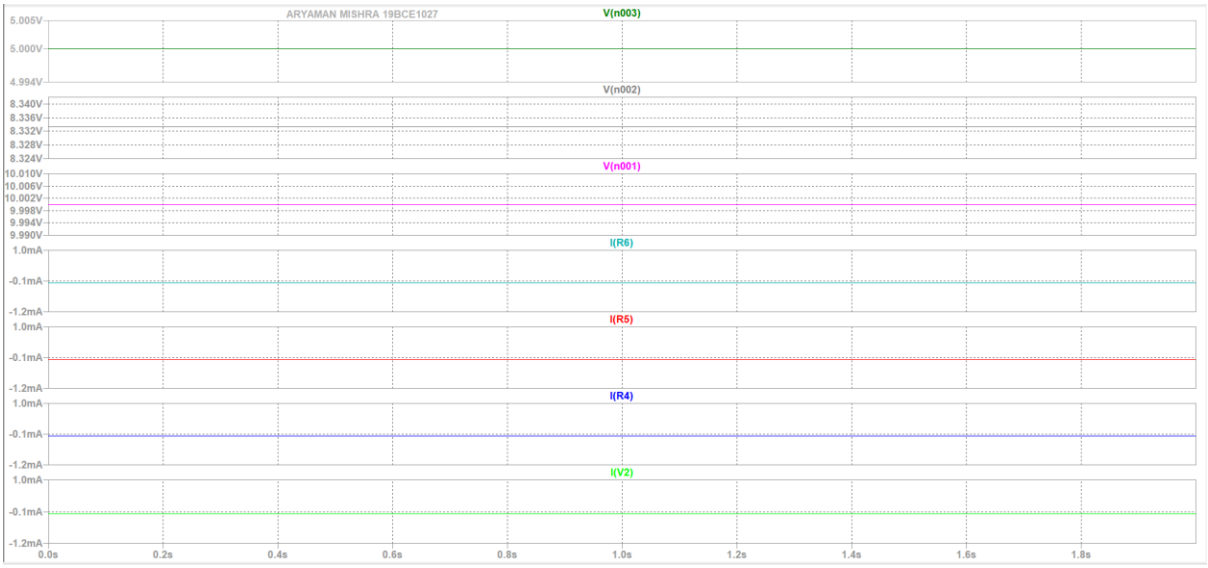
Plot 1



Circuit 2



Plot 2



INPUTS AND OUTPUTS:

Inputs

Components Used	Input Value
V1	10V
R1	10K Ohm
R2	20K Ohm
R3	30K Ohm

OUTPUTS (Circuit 1)

Node	Resultant Value
I(R1)	1mA
I(R2)	0.5mA
I(R3)	0.3mA
I(V1)	1.83mA
V(v_b) Through all resistors	10V

OUTPUTS (Circuit 2)

Node	Resultant Value
I(R1)	0.16mA
I(R2)	0.16mA
I(R3)	0.16mA
I(V1)	0.16mA
V(n001)	1.6V
V(n002)	3.3V
V(n003)	5V

Conclusion: Hence we successfully simulate the given circuits and find out the accurate voltage across the resistors and the current through the sources and resistors.

TASK 2

Aim: To find color code of resistors (4 band system)

Expression:

1st: 1st Digit
2nd : 2nd Digit
3rd : Multiplier
4th: Tolerance

	Colour 1	Colour 2	Colour 3	Colour 4
330kΩ with 5% tolerance	Orange	Orange	Yellow	Gold
470kΩ with 10% tolerance	Yellow	Violet	Yellow	Silver
66kΩ with 10% tolerance	Blue	Blue	Orange	Silver
3.2kΩ with 5% tolerance	Orange	Red	Red	Gold
540Ω with 10% tolerance	Green	Yellow	Brown	Silver
27Ω with 5% tolerance	Red	Violet	Black	Gold

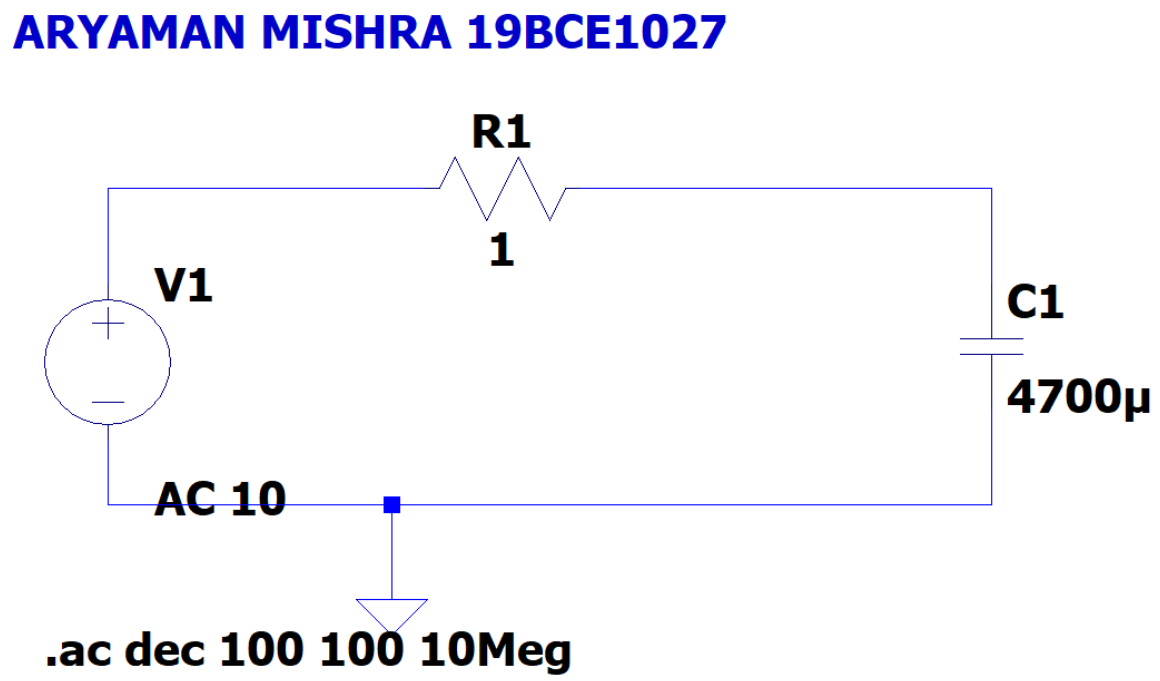
TASK 3

Aim: To simulate low pass filter (Capacitance)

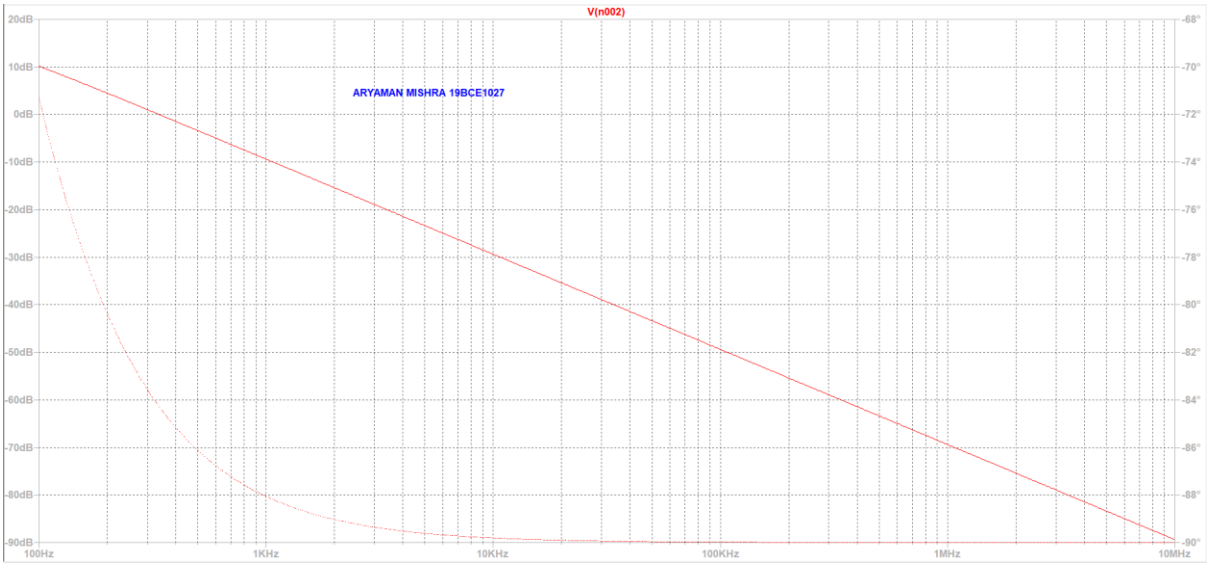
Software/Hardware Components used: LTSpice, 1Resistor, 1 Voltmeter, 1 Capacitor, Ground, Wire

Circuits and Plots:

Circuit



Plot



INPUTS AND OUTPUT:

INPUT

Components Used	Value
V1	AC Amplitude: 10 Type of Sweep: Decade Number of points per decade: 100 Start Frequency: 10

	Stop Frequency: 100 Meg
R1	1 Ohm
C1	4700 micrometer

OUTPUT

NODE	Value
V(n002)	20 to (-110) dB, 10 Hz to 100MHz

Conclusion: Hence we are able to simulate the circuit to show low pass filter in a capacitor.

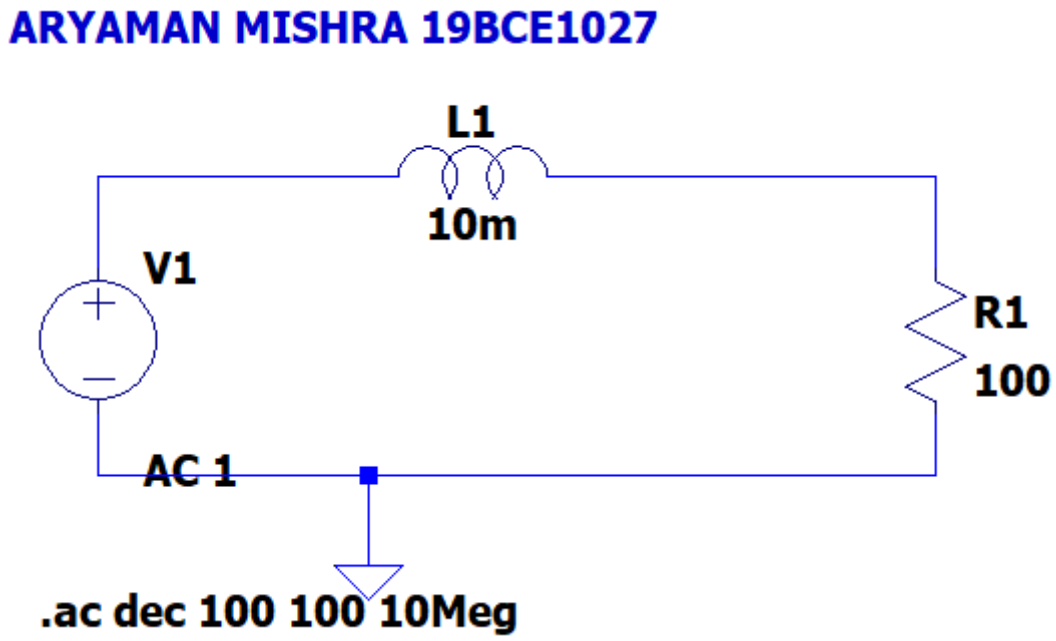
TASK 4

Aim: To simulate low pass filter (Inductance)

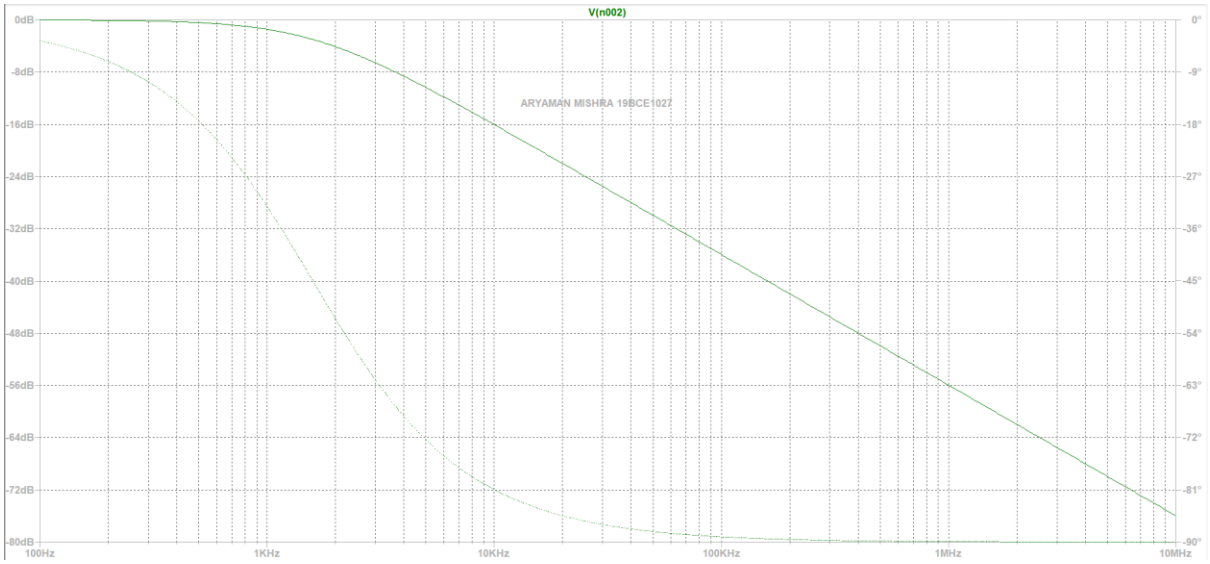
Software/Hardware Components used: LTSpice, 1 Resistor, 1 Voltmeter, 1 Inductor, Ground, Wire

Circuits and Plots:

Circuit



Plot



INPUTS AND OUTPUT:

INPUT

Components Used	Value
V1	AC Amplitude: 1 Type of Sweep: Decade Number of points per decade: 100 Start Frequency: 100 Stop Frequency: 10 Meg
R1	100 Ohm
L1	10 m

OUTPUT

NODE	Value
V(n002)	0 to (-80) dB, 100Hz to 10MHz

Conclusion: Hence we are able to simulate the circuit to show low pass filter in aninductor.

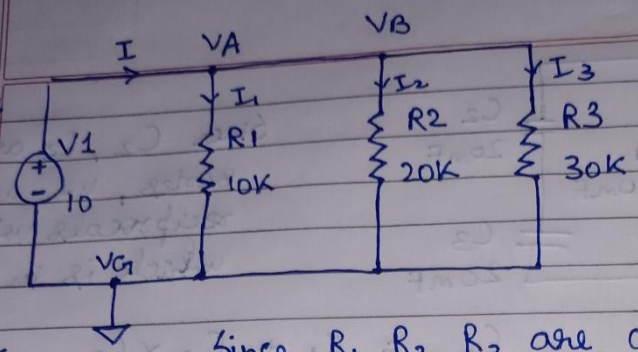
TASK 5

Aim: To find the total resistance of the circuit seen from the source. (Through formula and with V/I).

Circuit and Expressions:

PAGE NO.

Task 5 :



Method 1

Since R_1, R_2, R_3 are connected in parallel

$$\frac{1}{R_{net}} = \frac{1}{10(10^3)} + \frac{1}{20(10^3)} + \frac{1}{30(10^3)}$$

$$\frac{1}{R_{net}} = \frac{6 + 3 + 2}{60 \times 10^3}$$

$$R_{net} = \frac{60 \times 10^3}{11} = 5.\overline{45} \times 10^3 \Omega = \boxed{5.\overline{45}\ K\Omega}$$

Method 2

$$1/R_{net} = \left(\frac{1}{\frac{V}{I_1}}\right) + \left(\frac{1}{\frac{V}{I_2}}\right) + \left(\frac{1}{\frac{V}{I_3}}\right)$$

$$I_1 = \frac{V}{R_1} = \frac{10}{10 \times 10^3} = 10^{-3}\ A$$

$$I_2 = \frac{V}{R_2} = \frac{10}{20 \times 10^3} = 0.5 \times 10^{-3}\ A$$

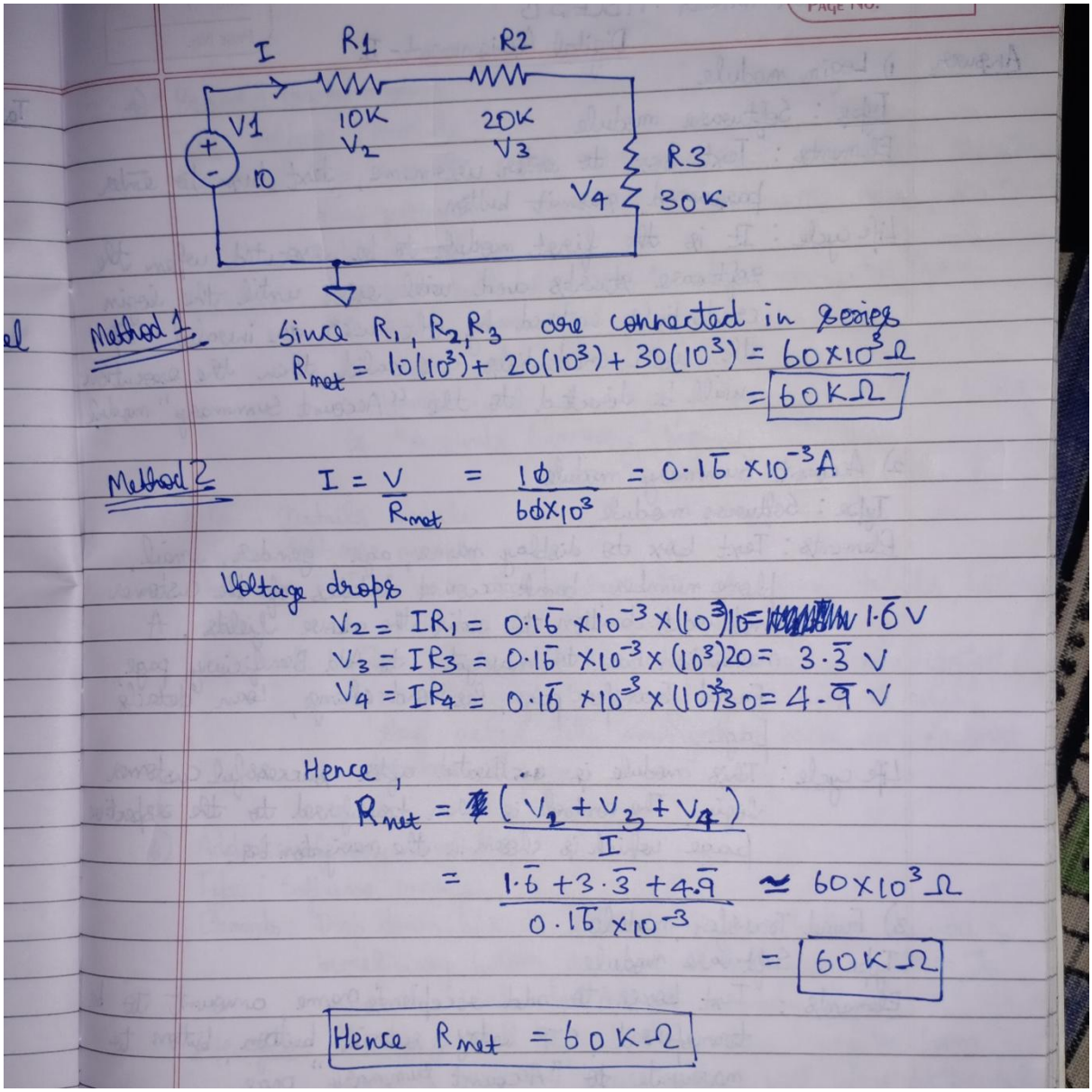
$$I_3 = \frac{V}{R_3} = \frac{10}{30 \times 10^3} = 0.\overline{3} \times 10^{-3}\ A$$

$$\therefore 1/R_{net} = \left(1/\frac{10}{10^{-3}}\right) + \left(1/\frac{10}{0.5 \times 10^{-3}}\right) + \left(1/\frac{10}{0.\overline{3} \times 10^{-3}}\right)$$

$$= (1/10^4) + (1/2 \times 10^4) + (1/3.\overline{3} \times 10^4)$$

$$1/R_{net} = 10^{-4}(1 + 0.5 + 0.3)$$

$$R_{net} = \frac{1}{1.8} \times 10^4 = 0.\overline{5} \times 10^4 = \boxed{5.\overline{5}\ K\Omega}$$



Method 1: Since R_1, R_2, R_3 are connected in series

$R_{net} = 10(10^3) + 20(10^3) + 30(10^3) = 60 \times 10^3 \Omega$

$= \boxed{60 K\Omega}$

Method 2: $I = \frac{V}{R_{net}} = \frac{10}{60 \times 10^3} = 0.1\overline{6} \times 10^{-3} A$

Voltage drops

$V_2 = IR_1 = 0.1\overline{6} \times 10^{-3} \times (10^3)10 = 1.\overline{6} V$

$V_3 = IR_3 = 0.1\overline{6} \times 10^{-3} \times (10^3)20 = 3.\overline{3} V$

$V_4 = IR_4 = 0.1\overline{6} \times 10^{-3} \times (10^3)30 = 4.\overline{9} V$

Hence,

$R_{net} = \frac{(V_2 + V_3 + V_4)}{I}$

$= \frac{1.\overline{6} + 3.\overline{3} + 4.\overline{9}}{0.1\overline{6} \times 10^{-3}} \simeq 60 \times 10^3 \Omega$

$= \boxed{60 K\Omega}$

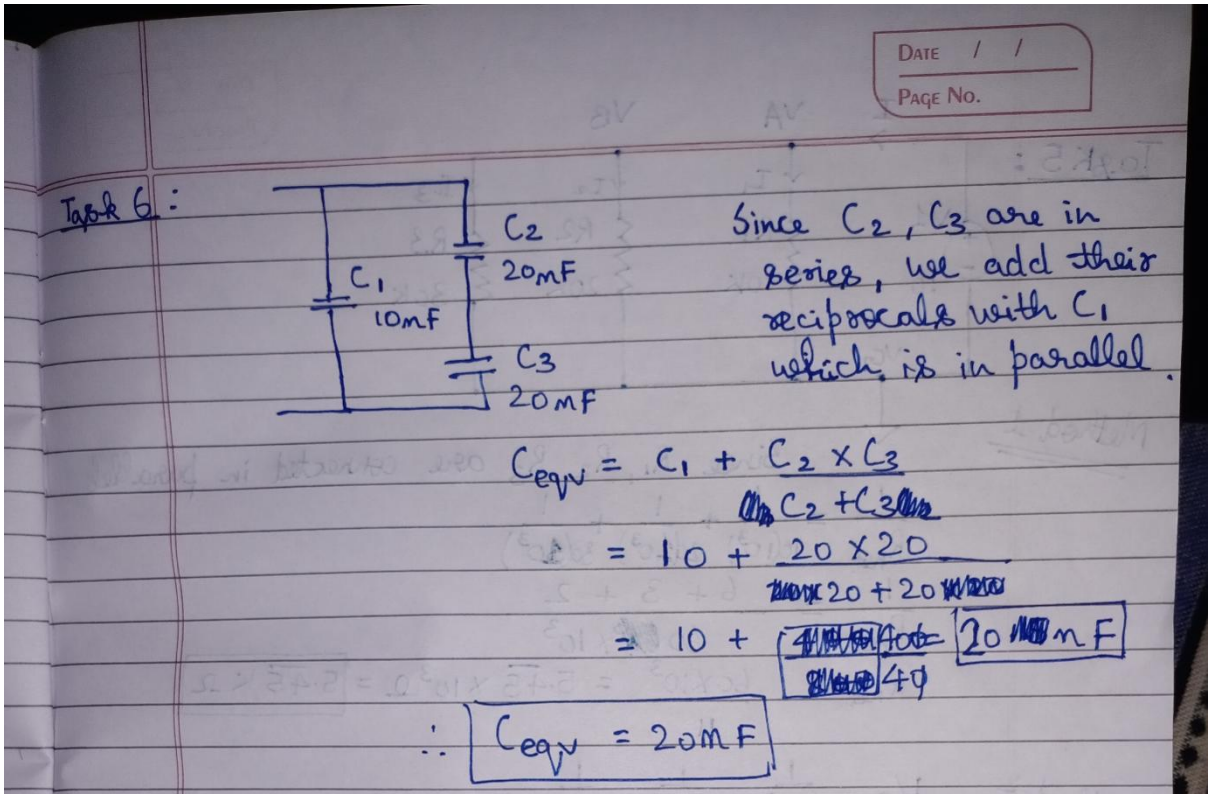
$\boxed{\text{Hence } R_{net} = 60 K\Omega}$

Conclusion: Hence the net resistance of circuit 1 is 5.5 K ohm and circuit 2 is 60 K ohm.

TASK 6

Aim: To find total capacitance of the circuit.

Circuit and Expressions:

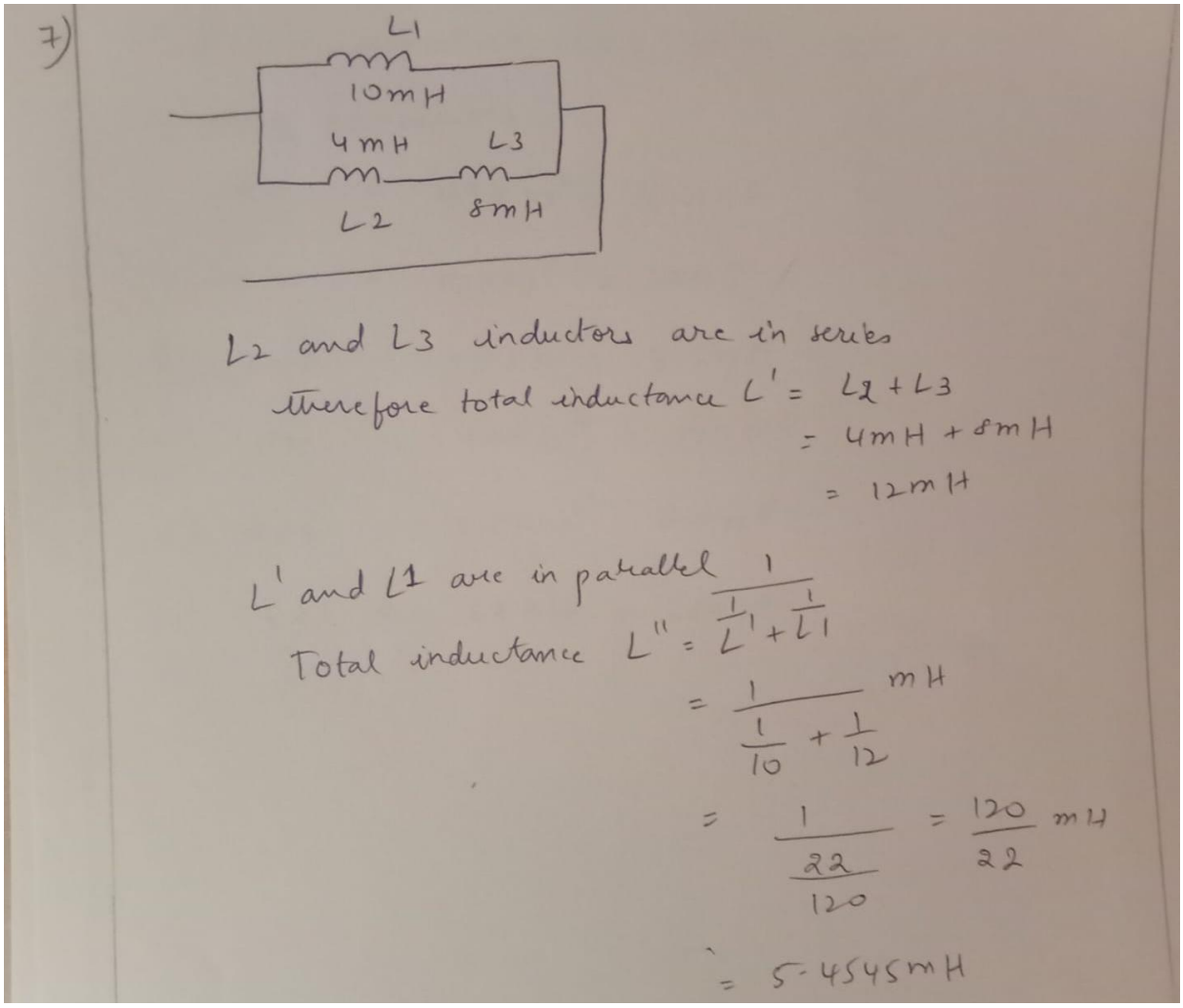


Conclusion: Hence the net capacitance of circuit is 20nF.

TASK 7

Aim: To find total inductance of the circuit.

Circuit and Expressions:



Conclusion: The net inductance of the circuit is 5.45mH.

TASK 8

Aim: To find the capacitance valueswith codes.

Circuit and Expressions: