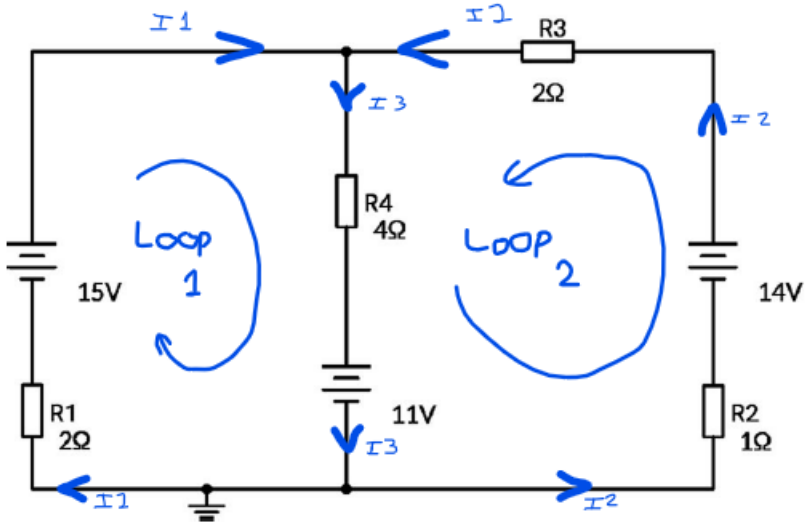
TMA 1 - ELECTRICAL AND ELECTRONIC PRINCIPLES: D.C and A.C. CIRCUITS

Q1.



Using Kirchhoff's Laws – Solve the 2 loops:

Loop 1 – Start at R1:

-2i1 + 15 - 4i3 - 11 = 0

4 - 2i1 - 4i3 = 0

Substitute i3 → i1 + i2:

4 – 2i1 – 4(i1 + i2) = 0

4 – 6i1 – 4i2 = 0

Calculate out i2:

Multiply by -7

-28 + 42i1 + 28i2 = 0

Loop 2 – Start at R2:

-1i2 + 14 - 2i2 - 4i3 - 11 = 0

3 - 3i2 - 4i3 = 0

Substitute i3 → i1 + i2:

3 - 3i2 - 4(i1+i2) = 0

3 - 7i2 - 4i1 = 0

Calculate out i2:

Multiply by 4

12 - 16i1 - 28i2 = 0

Add the 2 formulas:

-28 + 42i1 + 28i2 = 0

12 - 16i1 - 28i2 = 0

-16 + 26i1 = 0

Solve i1:

I1 = 16/26 = 0.615A

Solve i2 using loop 1 formula:

4 - 6(0.615) - 4i2

i2 = 0.31/4 = 0.077A

Q1.(a)

Current through 11V battery:

Solve i3: i3 = i1 + i2

i3 = 0.615 + 0.077 = 0.692A

Q1.(b)

Power dissipated in R1, R2 and R4: Use $P = I^2 * R$

R1 = $0.615^2 * 2$ = 0.756 Watts

R2 = $0.077^2 * 1$ = 0.006 Watts

R4 = $0.692^2 * 4$ = 1.915 Watts