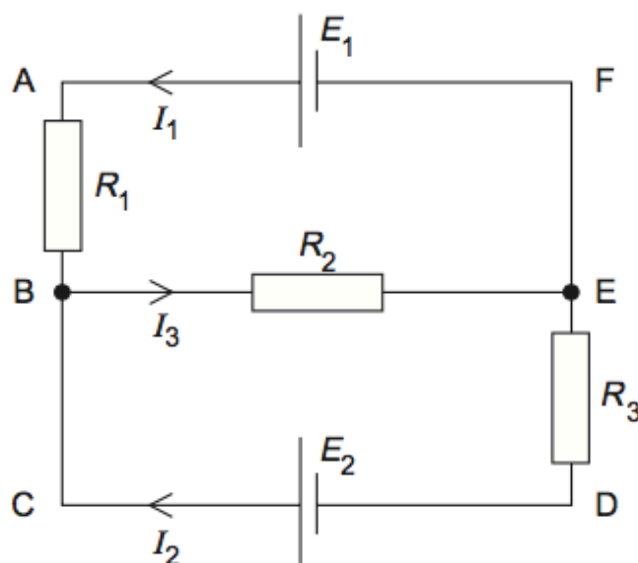


1)

Two cells of e.m.f. E_1 and E_2 are connected to resistors of resistance R_1 , R_2 and R_3 as shown in Fig. 7.1.



The currents I_1 , I_2 and I_3 in the various parts of the circuit are as shown.

(i) Write down an expression relating I_1 , I_2 and I_3 .

.....[1]

(ii) Use Kirchhoff's second law to write down a relation between

1. E_1 , R_1 , R_2 , I_1 and I_3 for loop ABEFA,

.....

2. E_1 , E_2 , R_1 , R_3 , I_1 and I_2 for loop ABCDEFA.

.....

[2]

2)

Two cells of e.m.f. E_1 and E_2 and negligible internal resistance are connected into the network in (a), as shown in Fig. 7.2.

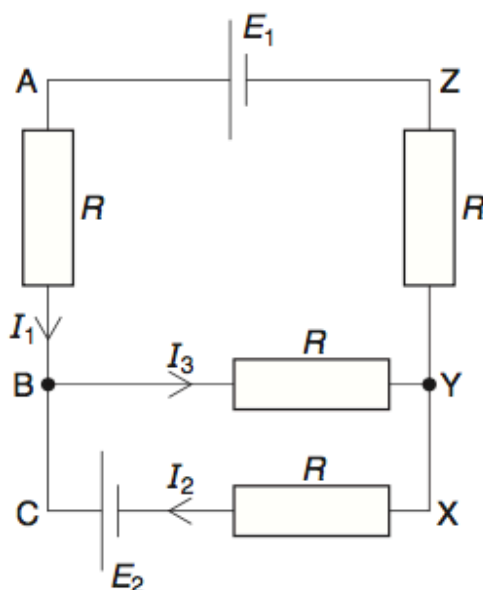


Fig. 7.2

The currents in the network are as indicated in Fig. 7.2.

Use Kirchhoff's laws to state the relation

(i) between currents I_1 , I_2 and I_3 ,

..... [1]

(ii) between E_2 , R , I_2 and I_3 in loop BCXYB,

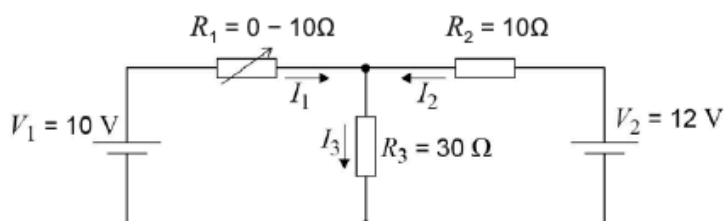
..... [1]

(iii) between E_1 , E_2 , R , I_1 and I_2 in loop ABCXYZA.

..... [1]

3)

The cells in the circuit shown in the figure below have zero internal resistance. Currents are in the directions shown by the arrows.



R_1 is a variable resistor with a resistance that varies between 0 and 10 Ω .

- (a) Write down the relationship between currents I_1 , I_2 and I_3 .

_____ (1)

- (b) R_1 is adjusted until it has a value of 0 Ω .

State the potential difference across R_3 .

potential difference = _____ V (1)

- (c) Determine the current I_2 .

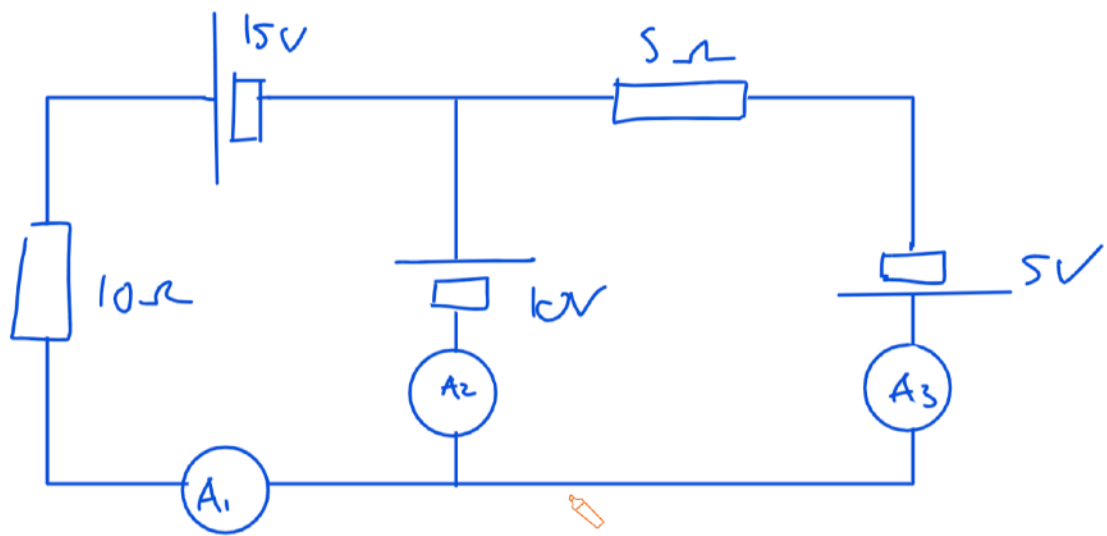
current = _____ A (2)

- (d) State and explain what happens to the potential difference across R_2 as the resistance of R_1 is gradually increased from zero.

(3)

(Total 7 marks)

4)



5)

