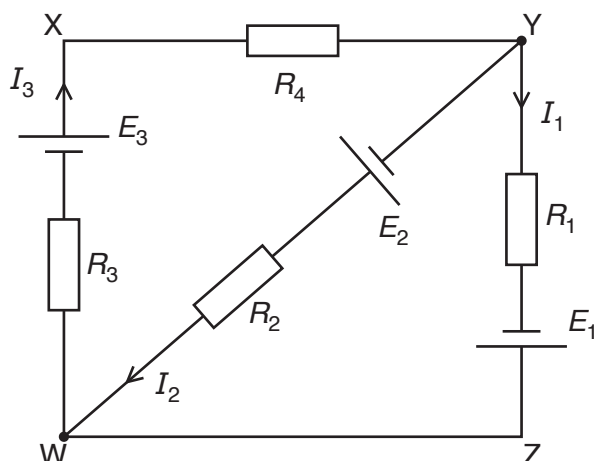5 Three cells of electromotive forces (e.m.f.) E_1, E_2 and E_3 are connected into a circuit, as shown in Fig. 5.1.

Fig. 5.1

The circuit contains resistors of resistances R_1, R_2, R_3 and R_4.
The currents in the different parts of the circuit are I_1, I_2 and I_3.
The cells have negligible internal resistance.

Kirchhoff's laws to state an equation relating

(a) I_1, I_2 and I_3,

....[1]

(b) E_1, E_3, R_1, R_3, R_4, I_1 and I_3 in loop WXYZW,

....

....[1]

(c) E_1, E_2, R_1, R_2, I_1 and I_2 in loop YZWY.

....

....[1]

[Total: 3]