

- 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.

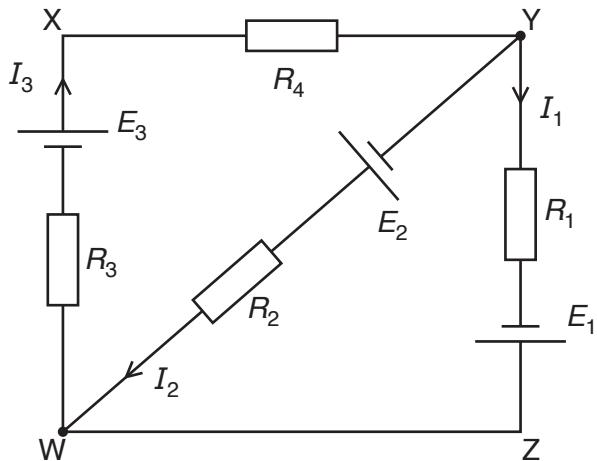


Fig. 5.1

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.

Use 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]

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

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[Total: 3]