7 A network of resistors, each of resistance R, is shown in Fig. 7.1.

For Examiner's Use

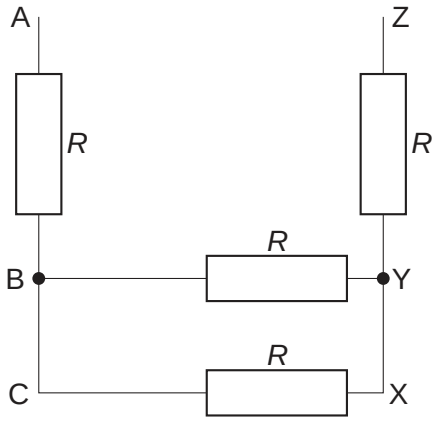

Fig. 7.1

(a) Calculate the total resistance, in terms of R, between points

(i) A and C,

resistance = ... [1]

(ii) B and X,

resistance = ... [1]

(iii) A and Z.

resistance = ... [1]

(b) 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.

For Examiner's Use

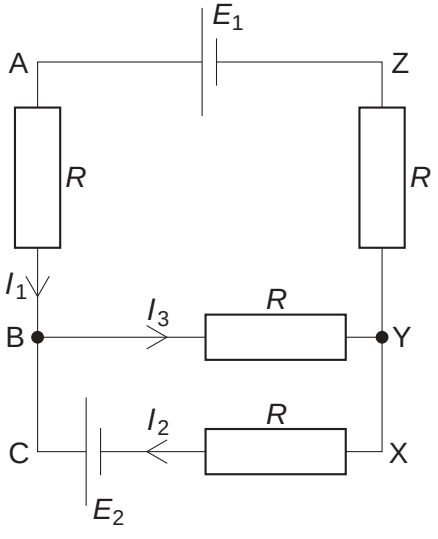

Fig. 7.2

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]