4 **(a)** A resistor "ladder" with 2 stages "*R*-2*R*" resistors, with values of *R* and 2*R,* are connected to an ideal cell of e.m.f. *V* as shown in Fig. 4.1.

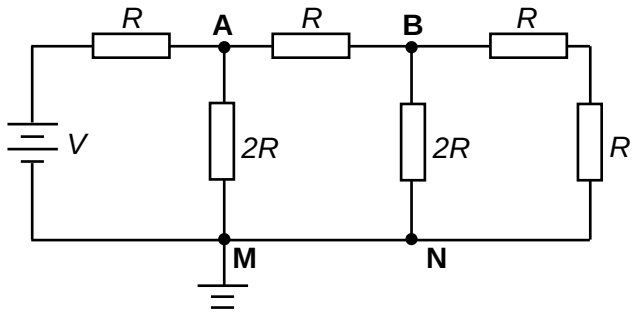


Fig. 4.1

(i) Show that the effective resistance between junction **A** and **M** is *R.*

[1]

(ii) Determine the potential at junction **A** in terms of *V*.

potential at **A** in terms of *V* ……..…….. [2]

(iii) Two additional "*R*-2*R*" stages, are added to the resistor "ladder" as shown in Fig 4.2.

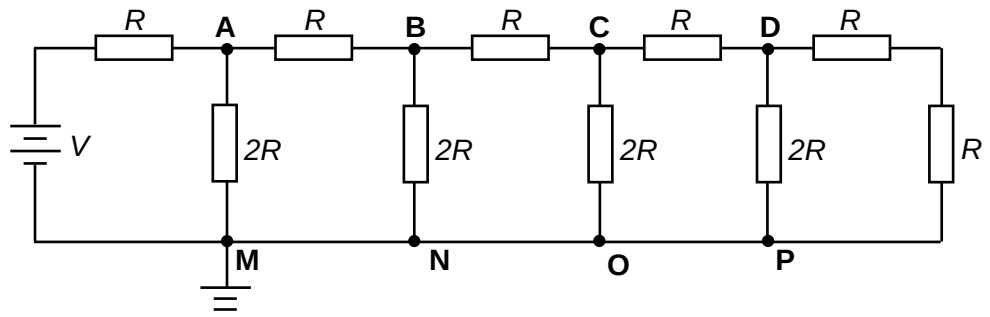


Fig 4.2

Using your answers from **(i)** and **(ii)**, deduce the potential at junction **D**, in Fig. 4.2 in terms of *V*.

potential at **D** in terms of *V* ……..…….. [2]

(b) The current-potential difference relationship for two electrical components P and Q is shown in Fig. 4.3.

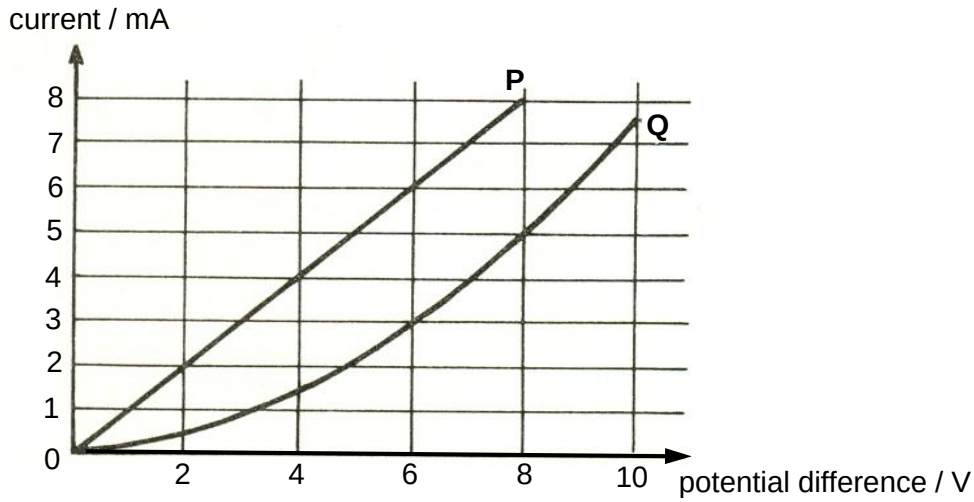
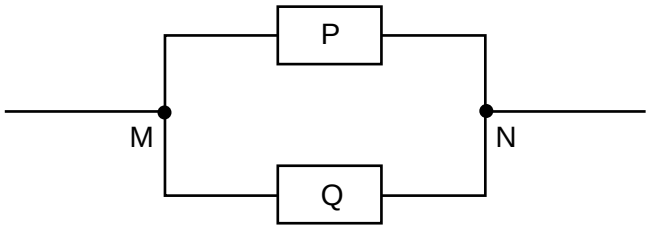


Fig. 4.3

P and Q are connected in parallel. The current flowing through P is 6 mA.



Determine the effective resistance between M and N.

effective resistance = ……..…….. Ω [3]

[Total: 8]