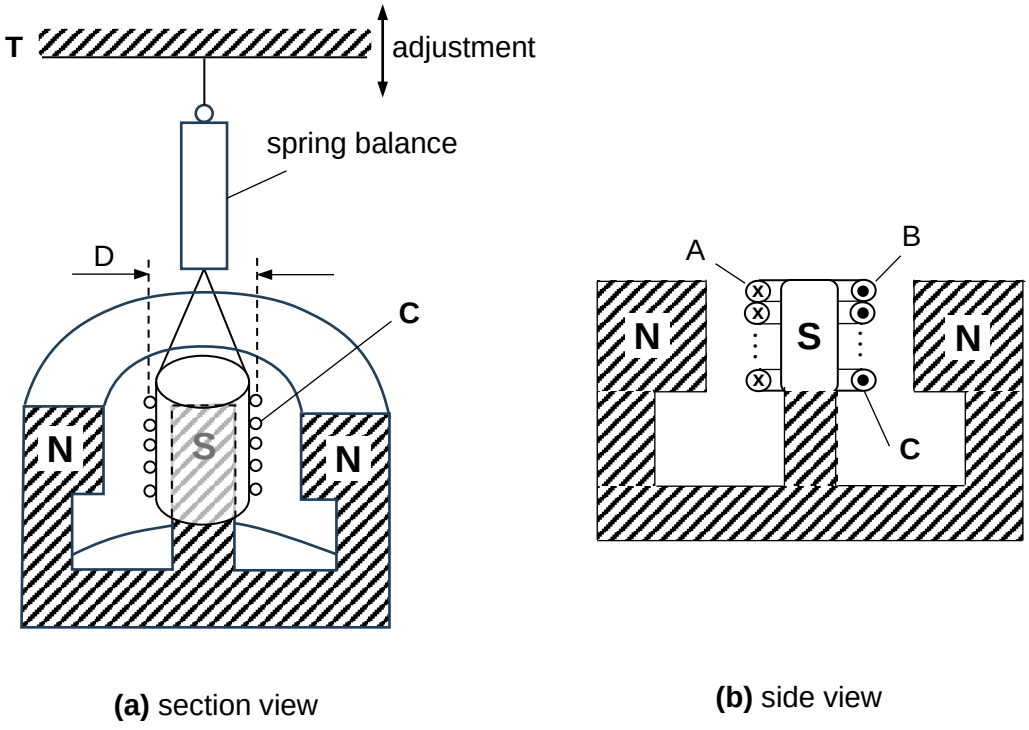
4 **(a)** Define magnetic flux density.

……

...……[1]

(b) Fig. 4.1 shows a loudspeaker magnet consisting of a circular north pole **N** and a cylindrical south pole **S**. Part **C** is a moving coil that coils around **S**, and it is attached to a spring balance, which is attached to an adjustable support **T**.



(a) section view

(b) side view

Fig. 4.1

Current was passed through the coil **C**, and the adjustable support **T** was then adjusted so that the coil **C** was restored to its original position. The readings *F* on the balance for various currents I are recorded in Table 4.1 below.

Table 4.1

I / A	0.20	0.41	0.60	0.81
F / N	1.50	2.02	2.48	3.05

(i) The direction of current flowing in the coil is indicated in Fig. 4.1(b). Draw two arrows, one each at positions A and B, to indicate the direction of the magnetic force acting on the coil. Explain your answer.

……

……

……

…… [3]

(ii) In Fig 4.2, draw a graph using values from Table 4.1 to determine the force per unit current required to restore coil **C** to its original position**,** and find the zero error of the balance.

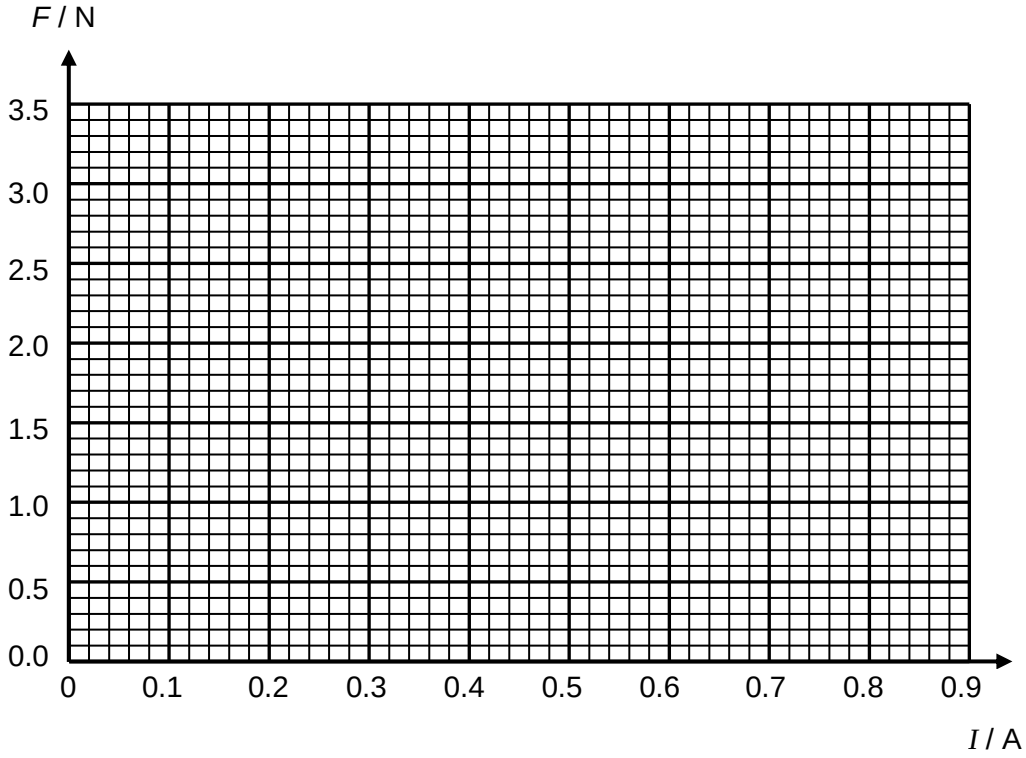


Fig. 4.2

force per unit current = ……N A^{-1}

zero error of the balance = …….. N [4]

(iii) If the mean diameter, *D*, of the coil is 0.025 m and the number of turns is 50, calculate the flux density at the coil, assuming that the field is radial.

magnetic flux density= ……T [2]

[Total:10]