PHYSICS

Paper – 2

(PRACTICAL)

(Maximum Marks: 30)

(Time allowed: Three hours)

(*Candidates are allowed additional 15 minutes for **only** reading the paper.*
They must NOT start writing during this time.)

ALL ANSWERS MUST BE WRITTEN IN THE ANSWER BOOKLET PROVIDED SEPARATELY.

If squared paper is used, it must be attached to the answer booklet.

Marks are given for a clear record of observations actually made, for their suitability and accuracy, and for the use made of them.

A brief statement of the method may be given if necessary. The theory of the experiment is not required unless specifically asked for.

Candidates are advised to record their observations as soon as they have been made.

All working, including rough work, should be done on the same sheet as, and adjacent to, the rest of the answer.

Mathematical tables and squared paper are provided. The intended marks for questions or parts of questions are given in brackets [ ].

Note: Procedure of the Experiment, ray diagram, circuit diagram and precautions are not to be written in your answer booklet.

Answer **all** *questions.*

You should not spend more than one and a half hours on Question 1.

Question 1 **[9]**

This experiment is based on the principle of a potentiometer.

You are provided with:

(a) a 100 cm long and uniform metallic wire AB fitted on a wooden board across a meter scale and provided with binding terminals at each end.

(b) a resistance box R having a range of 1Ω to (at least) 10 Ω.

(c) a 2V dc source (an accumulator or an electronic battery). It is labelled as D.

(d) a freshly dry cell. It is kept either in a battery holder or a battery box. It is labelled as E.

(e) a central zero galvanometer G.

(f) a plug key K.

(g) a jockey J and a few connecting wires.

(i) Set up a circuit as shown in ***Figure 2*** below:

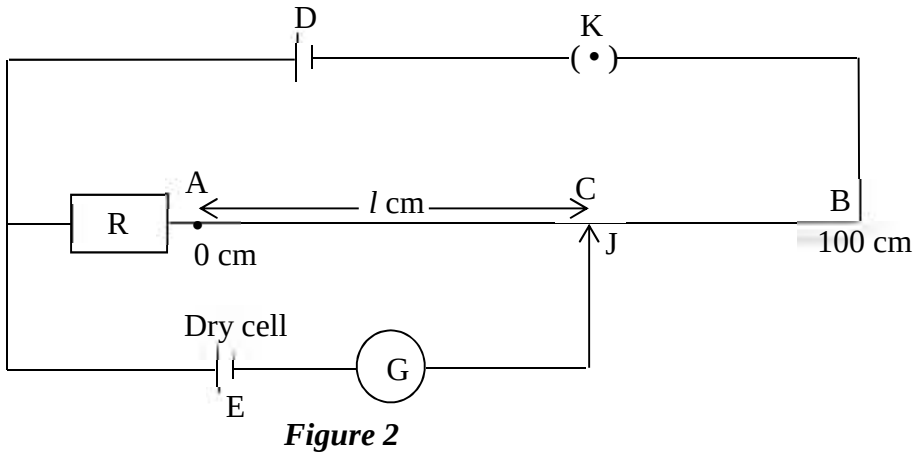

Figure 2

Ensure that all connections are tight.

(ii) Now, remove a 2Ω plug from the resistance box so that resistance offered by the resistance box R = 2Ω. Press the jockey gently at end A of the wire AB and note the deflection in the galvanometer G. Then, press the jockey gently at the other end, i.e. B of the wire AB and note the new deflection in the galvanometer. The two deflections must be in opposite directions.

(iii) Now, press the jockey gently at different points on the wire AB till at a certain point C, the galvanometer shows no deflection. This point C is called balancing point. Note and record the balancing length AC = l cm, correct upto **one decimal place**. While finding the balance point, you must not scrape the jockey on the wire, as it makes the wire uneven. You must lift the jockey and press it gently at a new point.

(iv) Now, repeat the experiment for five more values of R, R being in the range 2Ω to 10Ω. Each time, find the balance point and the balancing length AC = l cm.

(v) Tabulate all six sets of values of l and R with their units.

(vi) Show any one of the readings in 5 to the Visiting Examiner.

(vii) Plot a graph of l vs R taking l on y axis and R on x axis.

(viii) Draw the line of best fit and find its slope S′ using:

$$S = \frac{change\ in\ l}{change\ in\ R}$$

(ix) From the graph, read and record l_0 the value of l when R = 0. Now, calculate the value of k, using:

$$K = \frac{(l_0 - 100)}{S}$$

Question 2 **[6]**

This experiment determines the focal length of the given convex lens by **no parallax** method.

You are provided with:

(a) A lens holder

(b) A convex lens

(c) Two optical pins

(d) An optical bench

Note: *The experiment may be performed on a table top, using a metre scale, in case an optical bench is not available.*

(i) Mount the given convex lens (L) on the lens holder. Adjust the heights of object pin (O) and image pin (I) till their tips lie on the principal axis of the lens.

(ii) Now, arrange them as shown in ***Figure 1***:

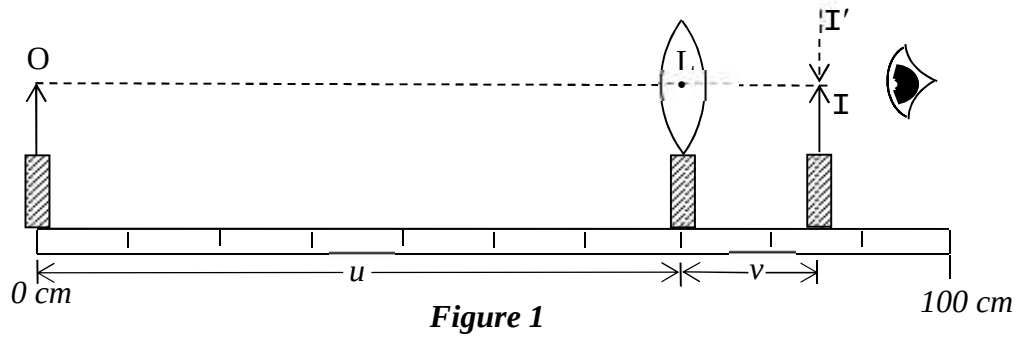

Figure 1

(iii) Keep the Object pin (O) is at zero cm mark and the lens (L) is at 70 cm mark so that the object distance (OL) = u = 70 cm. Look at the tip of the object pin, through the lens, from a distance. You will see a diminished and inverted image (I′) of the object pin.

(iv) Now, adjust the position of the image pin (I) till it coincides with I′. Thus, there is no parallax between I′ and I. Ensure that 'tip to tip' parallax is removed. Note this position (I) of the image pin and determine the image distance v = LI, correct up to **one decimal place**.

(v) Calculate q = $\frac{uv}{100}$ and p = $\left(\frac{u+v}{10}\right)$, both up to **one decimal place**.

(vi) Now, repeat the experiment for **five more** values of u in the range 20 cm to 70 cm. Each time, find v and calculate p and q.

(vii) Calculate focal length 'f' of the given convex lens using:

$$f = \frac{1}{p}\frac{q}{}$$

(viii) Tabulate all six sets of values of u, v,p, q and f with their units given at the column head.

(ix) Now show any one of the readings in (viii) above to the Visiting Examiner.

(x) Determine F, the mean of all values of *f*, correct up to one decimal place and record its value in your answer booklet, with its unit.