PHYSICS

PAPER – 2

(PRACTICAL)

(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.

*Statement of the theory, procedure of the experiment, apparatus, circuit diagrams, precautions are **not** required to be written, 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 [ ].

Answer **all** *questions.*

You should not spend more than one and a half hours on each question.

Question 1 **[12]**

This experiment determines the focal length of a convex lens by the displacement method.

(i) Determine the approximate focal length f_1 of the given convex lens (marked M) by projecting the image of a distant object on a wall or a screen. Record the value of f_1 in cm, correct up to one decimal place.

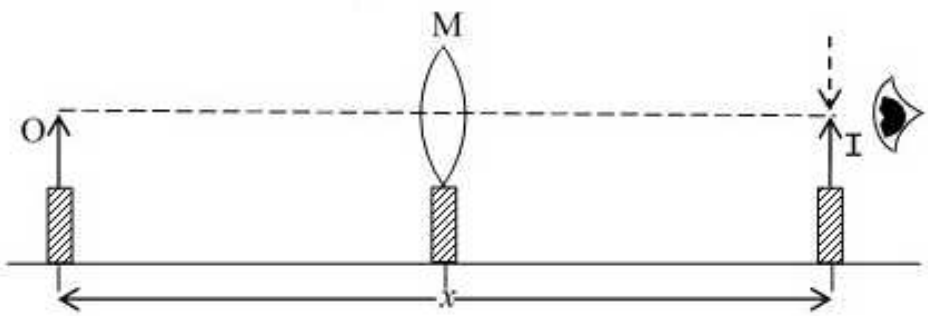

Figure 1 (a)

(ii) Arrange the object pin O, the image pin I and the lens M on an optical bench or table top as shown in ***Figure 1(a)*** so that the tips of O and I lie on the principal axis of the lens.

(iii) Adjust the distance *x* between O and I to be equal to 70 cm. Ensure that this separation is maintained throughout this particular set up.

(iv) Move the convex lens towards the image pin I and adjust its position until the diminished and inverted image of O coincides with the image pin I.

(v) Read and record the positions of **O, M_1 and I** on the meter scale in cm, correct up to one decimal place.

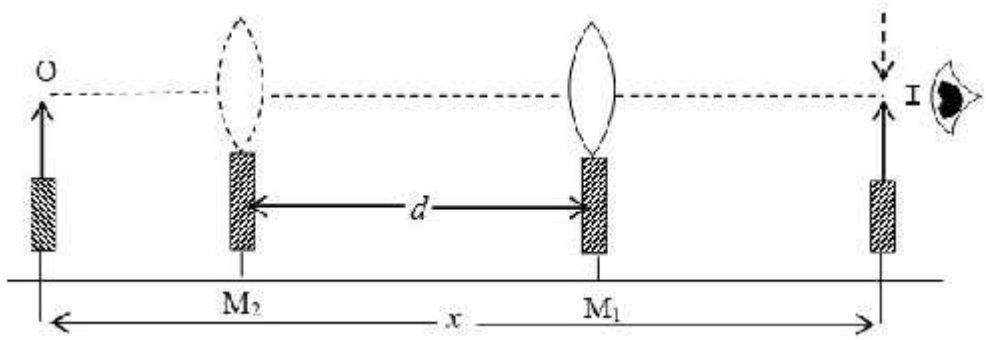

Figure 1(b)

(vi) Keeping O and I fixed, move the lens towards the object pin O and adjust its position as shown in ***Figure 1(b)*** until the magnified and inverted image of O coincides with I without parallax. Record the new position **M_2** of the lens.

(vii) The difference between the two positions **M_1** and **M_2** of the convex lens is the displacement ***'d'*** of the lens. Calculate and record the value of *d*, in cm, **correct upto 1 decimal place.**

(viii) Repeat the experiment to obtain **four more** sets of ***x*** and ***d*** where the range of ***x*** is between 70 cm and 100 cm.

(ix) Show the image position when the parallax has been removed, in <u>any one of the readings in (viii) above</u> to the Visiting Examiner.

(x) Tabulate the **five sets** of values of *x*, x^2, *d*, d^2 and $y = \frac{x^2 - d^2}{40}$, along with their units given at each column head. Compute *y* up to **three significant figures.**

(xi) Plot a graph of *y* against *x*. Draw the line of best fit and determine its slope $S = \frac{\Delta y}{\Delta x}$ = change in *y*/change in *x*.

(xii) Calculate the focal length *f* of the given lens correct up to one decimal place, using $f = 10 \times S$.

(xiii) Record the value of *f* in the answer book, with proper unit.

Question 2 **[6+2]**

A. This experiment determines resistance of a piece of metallic wire.

You are provided with one-metre long wire AB attached to a metre scale with terminals at the two ends. You are also provided with a resistance box RB, a coiled resistor 'r' with terminals, a jockey 'J', a two-volt *dc* power supply 'ε', a plug key 'K', a zero centre galvanometer and a few connecting wires.

(i) Set up a circuit as shown in ***Figure 2*** below. Ensure that all connections are right and tight.

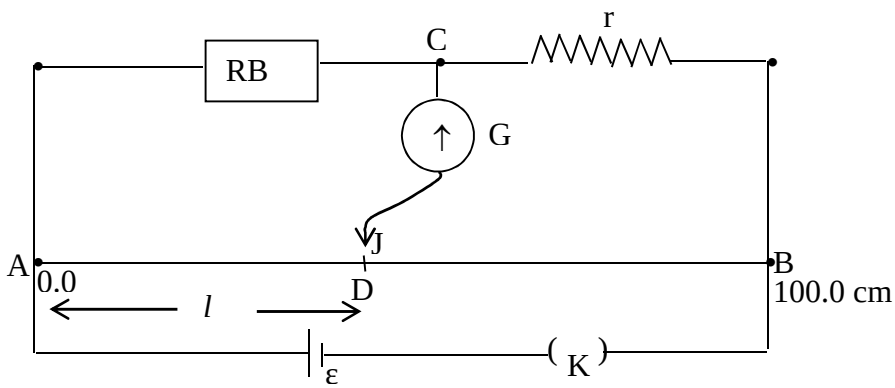

Figure 2

(ii) Take out a 2 ohm plug from the resistance box **RB** so that R = 2Ω. Press the jockey **J** gently on the wire AB, to obtain the null point D (galvanometer shows no deflection). Record l = AD in cm.

(iii) Repeat the experiment for **four more** values of R in the range 2Ω to 10Ω, and obtain coresponding values of l.

(iv) **Show <u>any one</u> of the readings in (iii) above to the Visiting Examiner**.

(v) Tabulate R and l with units given at the column head.

(vi) For each value of R, calculate $r = R\left(\frac{100-l}{l}\right)$ up to **three significant figures**.

(vii) Calculate the mean value of 'r', and record its value in your answer book with proper unit.

B. (i) Determine the least count of the given screw gauge in millimetre and the diametre 'd' of the given specimen wire.

(ii) Calculate specific resistance 'ρ' of the material of the wire using $\rho = 2.5 \times 10^{-7}\pi r d^2$ and record its value, in your answer booklet.

Question 3

Show the following to the Visiting Examiner for assessment:

(a) Project Report **[7]**

(b) Physics Practical File. **[3]**
