PAPER II

PRACTICAL WORK- 15 Marks

The experiments for laboratory work and practical examinations are mostly from two groups: (i) experiments based on ray optics and (ii) experiments based on current electricity.

The main skill required in group (i) is to remove parallax between a needle and the real image of another needle.

In group (ii), understanding circuit diagram and making connections strictly following the given diagram is very important. Polarity of cells and meters, their range, zero error, least count, etc. should be taken care of.

A graph is a convenient and effective way of representing results of measurement. It is an important part of the experiment.

There will be one graph in the Practical question paper.

Candidates are advised to read the question paper carefully and do the work according to the instructions given in the question paper. Generally they are not expected to write the procedure of the experiment, formulae, precautions, or draw the figures, circuit diagrams, etc.

Observations should be recorded in a tabular form.

Record of observations

- All observations recorded should be consistent with the least count of the instrument used (e.g. focal length of the lens is 10.0 cm or 15.1cm but **10 cm is a wrong record.)**
- All observations should be recorded with correct units.

Graph work

Students should learn to draw graphs correctly noting all important steps such as:

(i) Title

(ii) Selection of origin (should be marked by two coordinates, example 0,0 or 5,0, or 0,10 or 30,5; **Kink is not accepted).**

(i) The axes should be labelled according to the question

(ii) Uniform and convenient scale should be taken and the units given along each axis (one small division = 0.33, 0.67, 0.66, etc. should not to be taken)

(iii) Maximum area of graph paper (**at least 60% of the graph paper along both the axes**) should be used.

(iv) Points should be plotted with great care, marking the points plotted with (should be a circle with a dot) ⊙ or ⊗. A blob (●) is a misplot.

(v) The best fit straight line should be drawn. The best fit line does not necessarily have to pass through all the plotted points and the origin. While drawing the best fit line, **all experimental points must be kept on the line or symmetrically placed on the left and right side of the line.** The line should be continuous, thin, uniform and extended beyond the extreme plots.

(vi) The intercepts must be read carefully. Y intercept i.e. y_0 is that value of y when x = 0. Similarly, X intercept i.e. x_0 is that value of x when y=0. **When x_0 and y_0 are to be read, origin should be at (0, 0).**

Deductions

(i) The slope 'S' of the best fit line must be found taking two distant points **(using more than 50% of the line drawn), which are not the plotted points**, using $S = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$. Slope S must be calculated upto proper decimal place or significant figures as specified in the question paper.

(ii) All calculations should be rounded off upto proper decimal place or significant figures, as specified in the question papers.

NOTE:

Short answer type questions may be set from each experiment to test understanding of theory and logic of steps involved.

Given below is a list of required experiments. Teachers may add to this list, keeping in mind the general pattern of questions asked in the annual examinations.

Students are required to have completed all experiments from the given list (excluding demonstration experiments):

1. To find focal length of a convex lens by using u-v method (no parallax method)

   Using a convex lens, optical bench/metre scales and two pins, obtain the positions of the images for various positions of the object; f<u<2f, u~2f, and u>2f.

   Draw the following set of graphs using data from the experiments -

   (i) v against u. It will be a curve.

   (ii) Magnification $\left(m = \frac{v}{u}\right)$ against v which is a straight line and to find focal length by intercept.

   (iii) y = (100/v) against x = (100/u) which is a straight line and find f by intercepts.
2. To find f of a convex lens by displacement method.
3. To determine the focal length of a given convex lens with the help of an auxiliary convex lens.
4. To determine the focal length of a concave lens, using an auxiliary convex lens, not in contact and plotting appropriate graph.
5. To determine focal length of concave mirror by using two pins (by u-v method).
6. To determine the refractive index of a liquid by using a convex lens and a plane mirror.
7. To determine the focal length of a convex mirror using convex lens.
8. Using a metre bridge, determine the resistance of about 100 cm of (constantan) wire. Measure its length and radius and hence, calculate the specific resistance of the material.
9. Verify Ohm's law for the given unknown resistance (a 60 cm constantan wire), plotting a graph of potential difference versus current. Also calculate the resistance per cm of the wire from the slope of the graph and the length of the wire.
10. To compare emfs of two cells using a potentiometer.
11. To determine the internal resistance of a cell by a potentiometer.
12. From a potentiometer set up, measure the fall in potential (i.e. pd) for increasing lengths of a constantan wire, through which a steady current is flowing; plot a graph of pd (V) versus length (l). Calculate the potential gradient of the wire and specific resistance of its material. Q (i) Why is the current kept constant in this experiment? Q (ii) How can you increase the sensitivity of the potentiometer? Q (iii) How can you use the above results and measure the emf of a cell?
13. To verify the laws of combination of resistances (series and parallel) using metre bridge.

Demonstration Experiments *(The following experiments are to be demonstrated by the teacher)*:

1. To convert a given galvanometer into (a) an ammeter of range, say 2A and (b) a voltmeter of range 4V.
2. To study I-V characteristics of a semi-conductor diode in forward and reverse bias.
3. To study characteristics of a Zener diode and to determine its reverse breakdown voltage.
4. To study the characteristics of pnp/npn transistor in common emitter configuration.
5. To determine refractive index of a glass slab using a traveling microscope.
6. To observe polarization of light using two polaroids
7. Identification of diode, LED, transistor, IC, resistor, capacitor from mixed collection of such items.
8. Use of multimeter to (i) identify base of transistor, (ii) distinguish between npn and pnp type transistors, (iii) see the unidirectional flow of current in case of diode and an LED, (iv) check whether a given electronic component (e.g. diode, transistors, IC) is in working order.
9. Charging and discharging of a capacitor.

PROJECT WORK AND PRACTICAL FILE – 15 marks

Project Work – 10 marks

The Project work is to be assessed by a Visiting Examiner appointed locally and approved by the Council.

All candidates will be required to do **one** project involving some physics related topic/s under the guidance and regular supervision of the Physics teacher.

Candidates should undertake any **one** of the following types of projects:

- Theoretical project
- Working Model
- Investigatory project (by performing an experiment under supervision of a teacher)

Candidates are to prepare a technical report including title, abstract, some theoretical discussion, experimental setup, observations with tables of data collected, graph/chart (if any), analysis and discussion of results, deductions, conclusion, etc. The teacher should approve the draft, before it is finalised. The report should be kept simple, but neat and elegant. Teachers may assign or students may choose **any one** project of their choice.

Suggested Evaluation Criteria for Theory Based Projects:

▪ Title of the Project
▪ Introduction
▪ Contents
▪ Analysis/ material aid (graph, data, structure, pie charts, histograms, diagrams, etc.)
▪ Originality of work (the work should be the candidates' original work,)
▪ Conclusion/comments

Suggested Evaluation Criteria for Model Based Projects:

▪ Title of the Project
▪ Model construction
▪ Concise Project report

Suggested Evaluation Criteria for Investigative Projects:

▪ Title of the Project
▪ Theory/principle involved
▪ Experimental setup
▪ Observations calculations/deduction and graph work
▪ Result/ Conclusions

Practical File – 5 marks

The Visiting Examiner is required to assess the candidates on the basis of the Physics practical file maintained by them during the academic year.