2019

Part – II

PHYSICS

(Honours)

Paper – V

(Practical)

Full Marks – 100

Time : 6 Hours

Perform any one experiment from each group.

GROUP – A
(Non-Electrical Practical)

(Marks : 50)

[Experiment – 40, Laboratory Note Book – 5, Viva Voce – 5]

1. Determine the Young's Modulus of elasticity for the material of the given bar by the method of flexure. (For three different lengths of the bar).

   (a) Theory 4

   (b) Measurements of length, breadth and depth. 1+(1+2)+(1+2)

   (c) Load (m) – depression (l) data for three *lengths.* 3×3

(d) Load – depression graphs and calculation of $(\Delta m/\Delta l)$. 2×3+1×3

(e) Drawing of $\frac{1}{l^3}$ vs. $(\Delta m/\Delta l)$ graph. 3

(f) Calculation of Y by taking one point from above graph (e). 2

(g) Proportional error 2

(h) Discussion 2

(i) Accuracy 2

2. Determine the coefficient of viscosity (η) by capillary flow method.

(a) Theory for determining η without K.E. correction. 3

Theory for determining η with K.E. correction. 2

(b) Length of the capillary tube. 1

(c) Radius of the capillary tube (at its two ends measured by a travelling microscope, vertical and horizontal diameter, at least three times each side). 1+9

(d) Temperature of water 1

(e) Data for difference of liquid levels (h) and flow rate (v), (at least six h values). 9

(f) $h \sim v$ graph 4

(g) Calculation of η 2

(h) K.E. correction 2

(i) Proportional error 2

(j) Discussion 2

(k) Accuracy 2

3. Determine the focal length of a concave lens by combination method. Use two convex lenses of different focal lengths.

(a) Theory 3

(b) Data for index correction 1

(c) Data for focal lengths of the first convex lens and the lens combination (3 sets of data for each). 6+6

(d) Data for focal lengths of the 2nd convex lens and the lens combination (3 sets of data for each). 6+6

(d) Calculation of focal lengths 3+3

(e) Proportional error 2

(f) Discussion 2

(g) Accuracy 2

4. Determine the wavelength of a monochromatic light by Newton's ring experiment.

(a) Theory and Working formula. 3+2

(b) Spherometer constants and radius of curvature of the lens (at least four h). 2+4

(c) Vernier constant of the microscope. 1

(d) Data for ring diameters (D_n) and calculation of D_n^2 (at least ten rings). 10+2

(e) Drawing of D_n vs. n graph 3

(f) Graph of D_n^2 *vs.* n 3

(g) Calculation of wavelength using two graphs separately and make comment on the result. 3+1

(h) Proportional error 2

(i) Discussion 2

(j) Accuracy. 2

5. Calibration of spectrometer and determination of unknown wavelength.

(a) Working principle 2

(b) Spectrometer constant 1

(c) Levelling and adjustment of parallel rays 2

(d) Performing Schuster's method 2

(e) Direct reading 3

(f) Data for the prism at minimum deviation for sodium light. 4

(g) Data for deviations of spectral lines of known wavelengths (at least five). 10

(h) Data for deviation of spectral line of given unknown wavelength. 3

(i) Drawing of $D - \lambda$ curve 3

(j) Determination of wavelength of unknown line. 1

(k) Drawing of $D-\frac{1}{\lambda^2}$ curve 3

(l) Determination of wavelength of unknown line from the above curve (K) and make comment on two results. 1+1

(i) Discussion 2

(ii) Accuracy 2

6. Level and adjust a spectrometer for parallel rays. Measure the angle of the prism with the help of the spectrometer. Determine the refractive index of the material of the prism for five specified rays. Hence calculate the dispersive power of the material of the prism, within the wavelength region considered.

(a) Working principle and formula 3+2

(b) Spectrometer constants 1

(c) Levelling and adjustment for parallel rays 3

(d) Performing Schuster's method 2

(e) Data for angle of the prism 6

(f) Direct reading 3

(g) Minimum deviation for at least five different colours and calculation of μ for the colours. 10

(h) Drawing of $\mu - \frac{1}{\lambda^2}$ graph 4

(i) Calculation of dispersive power for two specified colours. 2

(j) Discussion 2

(k) Accuracy 2

7. Determine the width of a narrow single slit by studying the diffraction fringes produced by it and verify it by measurement with a travelling microscope.

(a) Theory and Working formula 2+2

(b) Levelling and adjustment for parallel rays 3

(c) Adjustment of mirror, scale and second telescope / or, other arrangement. 2

(d) Data for slit width from diffraction bands minima. (at least four minima, both sides of central maxima) 4×4

(e) Vernier constant of the travelling microscope. 1

(f) Slit width by the travelling microscope. (at least four times) 2×4

(g) Proportional error for diffraction method. 2

(h) Discussion 2

(i) Accuracy 2

8. Calibrate the given polarimeter for an active solution of different concentrations by volume. Hence find out the concentration of a given active solution of the same solute and determine the specific rotation of the solution.

(a) Working formula with theory 2+3

(b) Vernier constant 1

(c) Data for pure water 2

(d) Preparation of solutions of six different concentrations. 6

(e) Data with solution of known strength for 'C - θ' graph. 12

(f) 'C - θ' graph 3

(g) Concentration of the given active solution. 3

(h) Specific rotation 2

(i) Proportional error 2

0) Discussion 2

(k) Accuracy 2

9. Determine the thermal conductivity of a bad conductor by Lees and Chorlton's method.

(a) Working formula 3

(b) Measurements of diameter and thickness (at two places by travelling microscope) of the disc. 2+(1+5)

(c) Steady state temperature with initial temperature. 4+1

(d) Data for cooling curve 8

(e) Drawing of cooling curve 4

(f) Data for Bedford's correction 2

(g) Calculation 4

(h) Proportional error 2

(i) Discussion 2

(j) Accuracy 2

10. Determine the horizontal component of the Earth's magnetic field by magnetometer, [at least five different position of bar magnet for each side]

(a) Theory 3

(b) Measurement of length and breadth of the bar magnet by slide calipers (v.c. to be determined). 2+2+1

(c) Mass of bar magnet 3

(d) Readings of the deflection magnetometer. (Eight readings for each slide i.e. total sixteen readings for each position of bar magnet) 3×5

(e) Time period of oscillation of the bar magnet. 3

(f) Drawing of $\tan\theta \sim \frac{1}{d^3}$ graph. 4

(g) Calculations of B_H using graph or otherway. 3

(h) Proportional error 2

(i) Accuracy 2

GROUP – B

(Electrical and Electronics Practical)

(Marks : 50)

[Experiment – 40, Laboratory Note Book – 5, Viva Voce – 5]

11. Determine the temperature coefficient of resistance of the material of a given wire by using a Carey-Foster's bridge.
    - (a) Theory and working formula 2+2
    - (b) Circuit diagram 2
    - (c) Data for Measurement of ρ (five sets of readings) 10
    - (d) Data of measurement of resistance of the given wire at room temperature (at least three sets of readings.) 6
    - (e) Data for measurement of resistance of the given wire at boiling point of water (at least three sets of readings) 6
    - (f) Calculation 6
    - (g) Proportional error 2
    - (h) Discussion 2
    - (i) Accuracy 2
12. Verify Thevenin's and Norton's theorems.
    - (a) Statement of two theorems. 1+1
    - (b) Theory of both experiments 3+3
    - (c) Circuit diagrams 4

(d) Data for Load resistance-Load Voltage for Thevenin's theorem, (at least five load) 5

(e) Drawing of $V_L \sim I_L$ graph 3

(f) Calculation of R_g and open circuit voltage (V_{Lo}) from graph. 2

(g) Measurement of open cks voltage (V_g) and resistance offered by network (R_g) directly. 1+1

(h) Table for verification of Thevenin's theorem. 2

(i) Load current (by d.c. milliammeter) - Load resistance data for Norton's theorem, (at least five load). 5

(j) Drawing of $I_L \sim V_L$ graph 3

(k) Calculate of short circuit current (I_{Lo}) and slope ($M = {}^{-1}\!/_{Rg}$) 2

(l) Direct measurement of short circuit current (I_g) and Rg of the circuit. 2

(m) Verification table for Norton's theorem. 2

13. Study the variation of the thermo e.m.f. with temperature of the test junction of a thermocouple at six different temp (room temp to boiling point of water), keeping the cold junction in an ice bath. Hence obtain the mean thermoelectric power within the temp range 40°C to 80°C. Also find the melting/ freezing point of a given solid.

(a) Working formula and circuit diagram 2+2

(b) Circuit implementation 3

(c) Resistance of Potentiometer wire 6

(d) 'e' at different temperatures 15

(e) Data for melting/freezing point 3

(f) 'e'-'t' curve 3

(g) Determination of thermo-electric power and melting/ freezing point 2

(h) Proportional error 2

(i) Accuracy 2

14. Study the variation of resistance with temperature of a given thermister for two given constant voltages (set by the examiners). Hence find the melting / freezing point of a given solid. Also find the band gap from the thermister characteristics.

(a) Working formula and circuit diagram 2+2

(b) Circuit implementation 3

(c) Data for thermister characteristics, (two sets for two different voltages)

(at least seven readings for each) 7×2

(d) Recording of thermister current with time during melting / freezing 4

(e) Thermister characteristics (two separate graphs) 3×2

(f) Drawing of melting / freezing curves 3

(g) Determination of melting / freezing point from two characteristics curves 2

(h) Determination of band gap from two graphics 2

(i) Accuracy 2

15. Determine the boiling point of a given liquid using platinum resistance thermometer.

(a) Working formula and circuit diagram 2+2

(b) Circuit implementation 3

(c) Electrical mid point 2

(d) Data for resistance of Pt coil at three different temperatures 15

(e) Evaluation of 'p' of the bridge wire 3

(f) Barometric height and boiling point of water 3

(g) Calculation of resistance, 't_{pt}' and boiling point. 3+1+2

(h) Proportional error 2

(i) Accuracy 2

16. Determine the multi inductance (M) of the given pair of coils for at least thirteen different inclinations (ϕ) from 0° to 180°. Draw the '$M \sim \phi$' graph.

(a) Working formula and circuit diagram 2+2

(b) Circuit implementation 3

(c) Period of oscillation 4

(d) Measurement of log decrement 4

(e) Steady deflection 2

(f) Ballistic throws for different inclinations 13

(g) Calculation for M and '$M \sim \phi$' graph 2+4

(h) Proportional error in M at $\phi = 0°$ 2

(i) Accuracy 2

17. Determine the strength of magnetic field values between the pole pieces of an electromagnet due to different d.c. magnetising currents by a search coil, a ballistic galvanometer and a standard solenoid. Draw the '$I \sim B$' curve. (Constants of search coil and solenoid are supplied).

(a) Working formula and circuit diagram 2+2

(b) Circuit implementation 3

(c) Data (four) for '$I \sim d$' graph 4

(d) '$I \sim d$' graph , . 3

(e) Ballistic throws forat least seven magnetising currents 14

(f) Calculation of B 4

(g) '$I \sim B$' graph drawing 4

(h) Discussion 2

(i) Accuracy 2

18. Make a series CR circuit with suitable capacitor and resistance to an a.c. source to study the current voltage relationship and to study the variation of reactance of the capacitor with frequency of the a.c. sources.

(a) Working formula and circuit diagram 3

(b) Circuit implementation 2

(c) Data for I vs. V_C graph (at least for four input voltage for each frequency). (Take four frequencies say 50Hz, 100Hz, 150Hz, 200Hz). 4×4

(d) Draw $I \sim V_C$ graph for four input frequencies and obtain $1/Z_c$ for each case. 4×3

(e) Draw $1/Z_c \sim f$ graph and determine C from graph. 3

(f) Discussion 2

(g) Accuracy 2

19. Draw the resonance curve of a circuit containing a capacitor, a resistor and a coil of unknown inductance in series. Calculate the value of inductance from the resonant frequency. Repeat the observations with another resistor. Find, the Q factors for both the L-C-R combinations.

(a) Working formula and circuit diagra 4

(b) Circuit implementation 1

(c) Current versus frequency data for the L-C-R combinations 2×5

(d) Resonance curves 2×3

(e) Determination of L and Q from resonance curves 2+4

(f) Comparison of Q with theoretical values 2

(g) Data for phasor diagram at resonance for any one L-C-R combination 4

(h) Phasor diagram at resonance 3

(i) Discussion 2

(j) Accuracy 2

20. Study the reverse characteristics of given Zener diode to find its zener voltage and a.c. resistance. Also study the load regulation and line regulation characteristics.

(a) Theory and circuit diagram for each 3+3

(b) Circuit implementation 2+1×2

(c) Calculation of series resistance 2

(d) Data for V – A characteristic in reverse bias 4

(e) Drawing of V – A characteristic curve 3

(f) Determination of zener voltage and a.c. resistam from the graph 1+2

(g) Data for load regulation and line regulation 4+4

(h) Load regulation and Line regulation curves 3+3

(i) Percentage of regulation at specified load current 2

(j) Accuracy 2
