2019

UG 3rd Semester (Honours) Examination

PHYSICS

Paper - C6P

[Practical]

Full Marks : 20 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Distribution of Marks : Experiment - 15

LNB : 02

Viva : 03

Perform one experiment alloted through drawing cards.

1. Determine Mechanical Equivalent of heat by Callender and Barne's constant flow method.

   (a) Wroking formula. 2

(b) Circuit diagram. 1

(c) Initial steady temperature difference of the thermometers. 1

(d) Recording of steady temperatures at the inlet and outlet respectively, potential difference across the coil, current through it and rate of flow of liquid. 3×3

[for three different sets of currents and voltages]

(e) Calculation of mechanical equivalent of heat. 1½

(f) Accuracy. 1½

2. Determine thermal conductivity of copper by Searle's Apparatus.

(a) Working formula. 2

(b) Experimental diagram. 1

(c) Initial steady temperatures recorded by thermometers placed at the inlet and outlet of coiled tube; and two other points on the bar. 1

(d) Recording of temperatures of four thermometers at steady state during steam flow. 4

(e) Collection of water in given time 't'. 2

(f) Diameter of the bar by slide calliprs. (V. C. supplied) 2

(g) Distance between the thermometers on the bar. 1

(h) Calculation 1

(i) Accuracy 1

3. Determine thermal conductivity (k) of copper by Angstrom's method.

Apply a periodic square heat pulse to one end of a copper rod while other end reamins in room temperature. Record temperatures by two thermistors or other devices at a small distance Δx apart, as a function of time. Apply Fourier transformation for two distinct measurements of the thermal conductivity of the copper rod for 1st and 3rd hermonics of heat wave.

(a) Theory 2

(b) Arrangement for square heat pulse. 1

(c) Time-temperature data collection with proper acquisation unit. 5

(d) Fourier analysis of data 5

(e) K for 1st and 3rd harmonics of heat wave. 2

4. Determine thermal conductivity of a bad conductor by Lee and charlton's disc method.

[Mass and thickness of the lower disc, Diameter and thickness of the bad conducting disc and steady state temperature are to be supplied.]

(a) Wrokijng formula with Bedford's correction 2

(b) Time-temperature record during cooling (after direct heating by steam) 4

(c) Time-temperature graph to find rate of cooling 3

(d) Bedford's correction 1

(e) Calculation 2

(f) Accuracy 1

(g) Mention the process of measuring thickness of the experimental disc and the process of recording steady state temperature. 1+1

5. Determine the Temperature coefficient of Resistance (α) by Platinum Resistance Thermometer (PRT)

   [Measure resistance of PRT at two different known temperatures preferably at ice and steam]

   (a) Wroking formula and circuit diagram 1+1

   (b) Data for electrical mid point. 1

   (c) Data for determination of the resistance of the PRT ice and steam 4+4

   (d) Evaluation of resistance per unit length (p) of the bridge-wire. 1

   (e) Calculation of resistance at two different temperatures. 1+1

   (f) Evaluation of temperature cofficient (α) of resistance. 1

6. Study the variation of Thermo-Emf of a Thermocouple with difference of temperature of its two Junctions.

   [Resistance of the potentiometer wire is to be supplied]

(a) Working formula and circuit diagram 1+1

(b) Calculation of R to be put in series with potentiometer wire for $5^{\mu^v}/_{cm}$ drop 1

(c) Datas for e–t graph (at least six points) + calculation of e 6+2

(d) $e - t$ graph 2

(e) Determination of thermoelection power 1

(f) Accuracy 1

7. Calibration of a thermocouple within the temperature range of 80° C to 40°C with cold junction at ice bath. Hence finding melting point of Wax using calibration curve (null point length (l) vs. temperature (t) graph). (Rp is to be supplied]

(a) Working formula t circuit diagram 1+1

(b) Calculation of R to be put in series with potentiometer wire fo r $5^{\mu^v}/_{cm}$ drap, considering given Rp. 1

(c) Data for null-point length (l) vs. temperature graph 3

(d) Drawing of null point length (l) vs. temperature (t) graph. 2

(e) Data for null point length vs. time graph during metting or freezing of wax. 3

(f) Null point length vs. time graph. 2

(g) Determination of melting point using calibration curve. 1

(h) Accuracy 1

8. Calibration of a thermocouple within the temperature range of 80°C to 40°C with cold junction at ice bath, by direct measurement using OPAMP.

(a) Theory and circuit diagram 1+1

(b) OFF-SET null adjustment 2

(c) Hot junction temperature vs output voltage data for at least six difference temperatures. 6

(d) Calibration curve (hot junction temperature vs. output voltage) 2

(e) Calculationj of thermo-electric power from the calibration graph 2

(f) Accuracy 1
