

Kalyani University
B. SC. Semester - IV Examination – 2020
PHYSICS General Core Course – GCC-P-2

OPTION – A

(Thermal Physics)

Full Marks : 20

Answer any **four** questions :

4×5 = 20

1. Describe the mechanical equivalent of heat. Is it possible to convert heat to mechanical work with 100% efficiency? Why?
2. Write down the Stefan's law of radiation. What is the unit of Stefan's constant?
4. Define thermal conductivity of a metal. What is its unit?
5. Briefly describe the experimental setup for measuring the coefficient of thermal conductivity by Searle's Apparatus.
6. Discuss the advantages and disadvantages between Searle's method and Angstrom's method of measuring thermal conductivity.
7. Briefly describe the Lee and Charlton's disc method of measuring thermal conductivity of a bad conductor. Why is it necessary to attain steady state before recording data for cooling curve?
8. How does the resistance of a conductor and semiconductor change with temperature? Why?
9. What is meant by thermo e.m.f.? Why is it not possible to measure thermo e.m.f. directly by a voltmeter?
10. Write down the working principle of a thermocouple. Mention few applications of thermocouple.

OPTION – B

(Digital Systems and Applications)

Full Marks : 20

Answer any **four** questions :

4×5 = 20

1. Explain how can you test a transistor using a multimeter. What are the parameters of a transistor that can be measured with a multimeter.
2. Construct a NOT gate and a NAND gate using Transistor and diodes.

3. What are truth tables? Write down the truth table for a XOR and XNOR gate
4. What do you mean by DL, TTL, DTL and CMOS logic? Write down De-Morgan's theorems.
5. Which are the universal gates? Construct all basic gates using any one of the universal gate
6. What is the difference between a sequential logic circuit and a combinational logic circuit?
7. Construct and explain the functions of Half Adder, Full Adder and 4-bit binary Adder.
8. What is Flip-Flop? Construct Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
9. Design an astable multivibrator of given specifications using 555 Timer.