DCPH – 401

IV Semester B.Sc. Examination, September/October 2023
(NEP – Freshers)
PHYSICS (Paper – IV)
Thermal Physics and Electronics

Time : 2½ Hours

Max. Marks : 60

Instruction : *All Parts are* ***compulsory.***

PART – A

I. Answer **any four** questions, **each** carries **two** marks : **(4×2=8)**

1) State first law of thermodynamics.
2) Does the efficiency of a Carnot engine depend on the nature of working substance ? Explain.
3) What is a perfect black body ? Explain.
4) Why the field effect transistor so called ? Explain.
5) Op-amp can be used as a voltage multiplier. Explain.
6) NAND gate is called a universal gate. Why ?

PART – B

II. Solve **any four** of the following, **each** carries **five** marks : **(4×5=20)**

7) A gas of volume $2m^3$ at a pressure of 4×10^5 N/m^2 is compressed adiabatically to a volume of 0.5 m^3. Calculate the workdone during the process ($\gamma = 1.4$).
8) A refrigerator placed in a room at 300 K has inside temperature of 260 K. How many calories of heat shall be delivered to the room for each 1 kcal energy consumed by the refrigerator.
9) Calculate the change in melting point of ice when it is subjected to a pressure of 50 atmosphere. Density of ice 917 kg/m^3, density of water 1000 kg/m^3 and latent heat of ice 336×10^3 J/kg.
10) In a half wave rectifier the secondary voltage of the transformer is 30V, if the diode resistance is 25Ω and load resistance is 100Ω. Find the output dc voltage, average value of current and ripple factor.

P.T.O.

11) In a non-inverting summing amplifier $R_1 = 1K\Omega$, $R_2 = 2K\Omega$ and $R_3 = 5K\Omega$, if $V_1 = 1V$, $V_2 = 2V$ and $V_3 = 3V$. Calculate input currents and the output voltage if $R_f = 10\ K\Omega$.

12) Convert the decimal numbers 57 and 75 into their binary equivalent numbers.

PART – C

III. Answer **any four** questions. **Each** question carries **eight** marks : **(4×8=32)**

13) Obtain an expression for thermal efficiency of a Carnot's engine. **8**

14) a) State and explain the law of equipartition of energy.

b) Derive an expression for specific heat of gases. **(4+4)**

15) Deduce Planck's law of radiation. **8**

16) Obtain an expression for carrier concentration in an intrinsic semiconductor. **8**

17) Explain with a circuit diagram transistor characteristics in common-emitter configuration. **8**

18) Explain the working of logic gates OR, AND, NOR and NAND, write the corresponding gate symbols and the truth tables. **8**