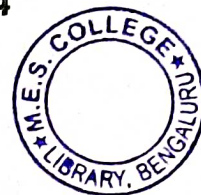Reg. No. ☐☐☐☐☐☐☐☐☐

IV Semester B.Sc. Degree Examination, July/August - 2024
PHYSICS
Thermal Physics and Electronics
(NEP Scheme Freshers 2021-22 and Onwards)
Paper : PHY. DSCT 4

Time : 2 ½ Hours   **Maximum Marks : 60**

Instructions to Candidates:
1. Follow the instructions under each Part.
2. Use of non-programable scientific calculators are allowed.

PART - A

Answer any Four questions. Each question carries 2 marks.   (4×2=8)

1. Distinguish between isothermal and adiabatic processes.

2. Write the expression for the work done in an isothermal process.

3. Define emissive and absorptive power.

4. State and explain Wien's displacement law.

5. Distinguish between n type and p type semiconductors.

6. Write the symbol and truth table of OR gate.

PART - B

Answer any Four questions. Each question carries 5 marks.   (4×5=20)

7. When 1000 cc of air at pressure of 10^5 is suddenly compressed to 250 cc. What will be the new pressure? ($\gamma = 1.4$)

8. Determine the change in entropy of 1 kg of water is heated from 10 ^{0}C to 95 ^{0}C at atmospheric pressure. (The specific heat of water $S_w = 4200$ J Kg^{-1} K^{-1}).

9. Seven particles have speeds 2, 4, 6, 6, 7, 9 and 8 ms^{-1}. Calculate the average and rms velocity of the particles.

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10. Calculate the energy radiated per second per unit area of a perfectly black body at 27°C ($\sigma = 5.67 \times 10^{-8}$ W $m^{-2} K^{-4}$).

11. In a phase shift oscillator, three network are identical with $R_1 = R_2 = R_3 = 10\,k\Omega$ and $C_1 = C_2 = C_3 = 12\,\mu F$. Find the frequency of oscillation.

12. Convert

    a) $(6AB)_{16}$ to decimal number

    b) $(63)_{10}$ to binary number.

PART - C

Answer any Four questions. Each question carries 8 marks.   **(4×8=32)**

13. a) Arrive at an expression for work done by a gas in an isothermal expansion.

    b) Explain with a diagram, the working of Carnot's heat engine and write the expression for its efficiency.   **(4+4)**

14. Obtain Maxwell's equations from thermodynamic potentials.

15. Derive Planck's radiation formula and show that Wien's law is special case of Plank's law.

16. a) Define α and β of a transistor and derive the relation between them.

    b) Explain with proper diagrams of forward and reverse biased p n junction.   **(6+2)**

17. a) What are the ideal characteristics of an op-amp?

    b) Derive an expression for the voltage gain of inverting amplifier using op-amp. **(4+4)**

18. a) State and prove de Morgan's theorems.

    b) Realise AND, OR and NOT gates using NAND gate.   **(4+4)**