

**INTERNAL ASSESMENT**

**KANDI RAJ COLLEGE**

**DEPARTMENT OF PHYSICS**

**SEMESTER: 6<sup>TH</sup>    STREAM: Honours (Core)**

**Papers:[ Electro-magnetic Theory + Statistical Mechanics +Communication Electronics + Biophysics]**

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**PAPER CODE: PHY-H-CC-T-13**

**Full Marks: 10**

**Answer any five questions**

**5×2=10**

1. What is magnetic vector potential? Prove that  $\vec{E} = -\vec{\nabla}V - \frac{\partial \vec{A}}{\partial t}$ , where the symbols have their usual meanings.
  2. What is Lorenz gauge? Show that  $\nabla^2 V - \mu_0 \epsilon_0 \frac{\partial^2 V}{\partial t^2} = \frac{-\rho}{\epsilon_0}$  using Lorenz gauge.
  3. How can one determine if a beam of light is unpolarized or circularly polarized?
  4. State and prove Brewster's law.
  5. Show that the Poynting vector is given by  $\vec{S} = \frac{1}{\mu_0} (\vec{E} \times \vec{B})$ .
  6. What is optical rotation? Describe Laurent's half shade polarimeter.
  7. What is double refraction? How can polarized light be obtained by double refraction?
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**PAPER CODE: PHY-H-CC-T-14**

**Full Marks: 10**

**Answer any five questions**

**5X2 =10**

1. What do you mean by Macrostate and Microstate? Explain with suitable example.
2. What do you mean by thermodynamic probability? How the entropy is related with thermodynamic probability?
3. Write down the comparative statement of MB, BE and FD statistics.
4. What do you mean by Boson and Fermion? Give two examples for each.
5. State Pauli's Exclusion Principle.
6. Show that the Maxwell-Boltzmann energy distribution law is a limiting case of the Bose-Einstein and Fermi-Dirac distribution.
7. Explain graphically the Fermi distribution at Zero and non-zero temperature.

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**PAPER CODE: : PHY-H-DSE-T-03**

**Full marks: 10**

**Answer any five questions:**

**5×2=10**

**Answer any five questions:**

1. What do you understand by means of a Signal? What are the properties of it?
  2. Define Modulation. Why it is necessary?
  3. What are the different types of SSB modulation?
  4. Draw the block diagram of a SSB-SC modulator and Demodulator.
  5. We need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need?
  6. What is Sampling Theorem?
  7. Write down the differences between PAM, PPM and PWM signals?
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**PAPER CODE:PHY-H-DSE-T-04**

**Full marks: 10**

**Answer any ten questions:**

**10×1=10**

1. A biological polymer contains alanine, tyrosine, and lysine. Which of the following will be true about this molecule  
[A] DNA                      [B] Strong base                      [C] Phospholipid                      [D] Protein
2. Which of the following bonds is weakest  
[A] Covalent bond      [B] Hydrogen Bond      [C] Van der Waals bond                      [D] Electrovalent bond
3. Gibbs free energy (G) is related to enthalpy (H) and entropy (S) by the following relation  
[A]  $G = U - TS$       [B]  $G = U + TS$                       [C]  $G = H - TS$                       [D]  $G = W - TS$
4. The process by which DNA converts into RNA is called  
[A] Transcription                      [B] Replication                      [C] Transformation                      [D] Mutation
5. RNA does not have the following base—  
[A] Uracil                      [B] Thymine                      [C] Adenine                      [D] Cytosine

6. The building blocks of life are---

- [A] Proteins                      [B] Carbohydrates                      [C] Lipids                      [D] Nucleic Acids

7. The equation ,  $\frac{\partial \rho}{\partial t} + \vec{\nabla} \cdot (\rho \vec{u}) = 0$  , is known as—

- [A] Heat equation    [B] Continuity equation    [C] Navier stokes equation    [D] Diffusion equation

8. Kinesin is a—

- [A] minus-end directed motor protein                      [B] microtubule  
[C] positive-end directed motor protein                      [D] cargo

9. The example of autonomous organelle(s)---

- [A] Mitochondria    [B] Chloroplast    [C] ] Mitochondria and Chloroplast                      [D] None of the above

10. For a spontaneous process at constant pressure, the change in Gibbs energy will be---

- [A] Positive                      [B] Negative                      [C] Zero                      [D] Infinite

11. Laminar flow occurs if the value of Reynolds number is—

- [ A ] low                      [B] zero                      [C] high                      [D] n one of the above
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