

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (AI&ML/AI&DS/Block Chain/CE/CSE/Cyber Security/
DS/IOT/CSDn/EEE/EE/ECE/Industry Integrated/IT/ME/
Internet of Things and Cyber Security Including Block Chain
Technology) (Sem-1,2)**

ENGINEERING PHYSICS

Subject Code : BTPH101-23

M.Code : 93794

Date of Examination : 17-01-2026

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION - B & C** have **FOUR** questions each.
3. Attempt any **FIVE** questions from **SECTION B & C** carrying **EIGHT** marks each.
4. Select at least **TWO** questions from **SECTION - B & C**.

SECTION - A

- I. **Write short notes on :**
 - a. What are Miller Indices?
 - b. Explain the working principle of Photo diode.
 - c. Distinguish between Diamagnetic and Paramagnetic materials.
 - d. Calculate Divergence of $\vec{r}$, where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.
 - e. Show that group velocity is equal to particle velocity.
 - f. Explain why two levels laser does not exist?
 - g. What is Holography?
 - h. Distinguish between Splicer and Coupler.
 - i. What is electron confinement?
 - j. List any four applications of laser.

SECTION - B

2. What are X-rays? State and derive Bragg's law for X-ray diffraction in crystals. Explain the significance of each term.
3. What is Tunnel diode? Draw and Explain the V-I characteristic of Tunnel diode.
4. Derive the London equations for superconductors and explain their physical significance.
5. a) Explain Dielectric polarization. What is Displacement current?
b) What is Gradient of scalar field? Discuss the physical significance gradient.

SECTION - C

6. Explain the construction and working of Ruby laser with the help of energy level diagram. Why Ruby laser is a pulsed laser?
7. a) Define Numerical Aperture (NA) of an optical fiber. Derive its expression in terms of the refractive indices of the core and cladding. Explain physical significance of NA.
b) An optical fiber has a core refractive index $n_1 = 1.50$ and a cladding refractive index $n_2 = 1.45$. Calculate the Numerical Aperture and acceptance angle in air.
8. Explain dual nature of matter and describe briefly Davisson and Germer experiment for qualitative verification of matter waves.
9. Explain the synthesis of nanomaterials using ball milling and sol-gel techniques.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.