R18 Regulation *Subject code:* **2B1AF**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech I Semester Supplementary Examinations, January 2026

Physics-I

(Common to EEE,ECE,CSE & IT)

Maximum Marks: 70 Date: 07.01.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks **(10x2M=20 Marks)**

1 A light wave enters from air into glass. How will the following be affected: (i) Energy of the wave (ii) Frequency of the wave?

2 Two identical coherent waves, each of intensity I_0, are producing an interference pattern. Write the value of the resultant intensity at a point of (i) constructive interference and (ii) destructive interference.

3 Write Brewster's law.

4 Distinguish between Fresnel and Fraunhofer diffraction.

5 Explain the role of optical resonator in a laser device.

6 Explain the necessity of population inversion in lasing action.

7 Mention any two applications of optical fibers.

8 Define acceptance angle and numerical aperture of an optical fibre.

9 What voltage must be applied to an electron microscope to produce electrons of wavelength 0.5 Å?

10 Explain physical significance of wave function Ψ.

Part-B

Answer All the following questions. **(10M X 5=50Marks)**

11 Determine the wavelength of monochromatic light and refractive index of a thin film using Michelson's interferometer.(10M)

OR

12 Explain how Newton's rings can be used to determine the refractive index of the convex lens. (10M)

13 a. State the condition under which the diffraction of light takes place. (4M)
b. Derive an expression for the linear width of central maximum due to diffraction of light at a slit. (6M)

OR

14 a. Describe how a Nicol's prism can be used as analyzer. (5M)
b. What are polaroids? Give some uses of polaroids. (5M)

15 a. Differentiate spontaneous emission and stimulated emission of radiation. (4M)
b. Derive the relation between Einstein coefficient. (6M)

OR

16 a. Describe the construction and working of He-Ne laser. (6M)
b. List any four applications of Lasers. (4M)

17 a. Distinguish between step index and graded index optical fibers (4M)
b. Derive an expression for the numerical aperture and fractional index change of an optical fiber. (6M)

OR

18 a. Explain the principle of an optical fiber with neat diagrams. (6M)
b. The refractive indices of core and cladding material are 1.563 and 1.498 respectively. Calculate numerical aperture, acceptance angle and critical angle. (4M)

19 a. State and explain de-Broglie's duality principle. (3M)
b. Describe the G.P. Thompson's experiment to demonstrate the wave character of electrons. (7M)

OR

20 a. Derive Schrodinger's time independent wave equation. (5M)
b. Obtain expressions for energy levels and wave functions of a particle enclosed in a one dimensional potential box of an infinite height and show that the energies of a particle are quantized. (5M)