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Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S,FE) S2(S) / S2 (FE) Examination May 2022 (2015 Scheme)

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all Questions. Each question carries 2 Marks

Marks

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| 1 | What is meant by resonance in forced oscillation? Give one example. | (2) |
| 2 | Define wavelength and wave velocity of a wave. | (2) |
| 3 | What are Antireflection coatings? | (2) |
| 4 | Give Rayleigh's criterion for the limit of spectral resolution . | (2) |
| 5 | What is Kerr effect? | (2) |
| 6 | What are high temperature superconductors. Give one example. | (2) |
| 7 | State Heisenberg's Uncertainty principle. | (2) |
| 8 | Distinguish between macrostates and microstates. | (2) |
| 9 | Define absorption coefficient of sound for a surface? | (2) |
| 10 | Mention any two methods to detect ultrasonic sound. | (2) |
| 11 | Write any four properties of laser. | (2) |
| 12 | List any four advantages of optical fibres over conventional transmission lines. | (2) |

PART B

Answer any 10 questions. Each question carries 4 Marks

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| 13 | Derive the differential equation of a forced harmonic oscillator. | (4) |
| 14 | A piece of wire 50 cm long is stretched by a load of 2 kg and has a mass of 1.42g .Find the fundamental frequency of the string. | (4) |
| 15 | The diameter of the 10th and 20th Newton's rings formed with a plano convex lens and an optically plane glass plate are 0.415 x 10⁻² m and 0.616x 10⁻²m respectively. If the wavelength of the interfering light is 5893Å , calculate the radius of curvature of the lens. | (4) |
| 16 | A parallel beam of light is incident normally on a plane transmission grating having 6000 lines/cm and a second order spectral line is observed at an angle of 30° Calculate the wavelength of light used. | (4) |
| 17 | Calculate the thickness of a mica sheet required for making a quarter wave plate | (4) |

for $\lambda = 550\text{nm}$. The refractive indices for the ordinary and extraordinary rays in mica are **1.584** and **1.594** respectively.

- 18 Give any four applications of superconductors. (4)
- 19 What are operators in Quantum mechanics? Obtain the energy operator. (4)
- 20 State the any four postulates of Bose-Einstein statistics. (4)
- 21 The area of interior surface of an auditorium is **3300m²**. Its reverberation time is **1.4 s**. If the average absorption coefficient of interior surface is **0.42 sabin**, Find the volume of the auditorium. (4)
- 22 A nickel rod of length **8 cm** is used in a magnetostriction oscillator. Calculate the frequency of ultrasonic waves generated. Young's modulus of nickel = **2.07 x 10¹¹ Nm⁻²** and density of nickel = **8900 kg/m³** (4)
- 23 What are the advantages of holography over photography? (4)
- 24 Explain the construction and working of an LED. (4)

PART C

Answer any three questions. Each question carries 6 Marks

- 25 Obtain an expression for the velocity of transverse waves in a stretched string. (6)
- 26 Derive the expression for the bandwidth of interference fringes in an air wedge and describe an experiment to determine the diameter of a thin wire using air wedge. (6)
- 27 Describe the construction of Nicol prism. Show that it can be used as a polarizer and an analyser. (6)
- 28 Obtain the time dependent and independent Schrodinger wave equations. (6)

PART D

Answer any three questions. Each question carries 6 Marks

- 29 Explain reverberation and reverberation time. Write the significance of reverberation time. How is reverberation different from echo? (6)
- 30 What is inverse piezoelectric effect? With the help of a circuit diagram explain the production of ultrasonic waves using a piezoelectric oscillator. (6)
- 31 Explain the construction and working of Ruby laser. (6)
- 32 Define numerical aperture of an optical fibre. With the help of a diagram derive the expression for Numerical aperture of a step index fibre. (6)
