

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Second Semester B.Tech Degree Examination July 2021 (2019 scheme)

Course Code: PHT100
Course Name: ENGINEERING PHYSICS A
(2019 Scheme)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

- | | Marks |
|---|-------|
| 1 What is meant by sharpness of resonance? | (3) |
| 2 State the 3 laws of transverse vibrations. | (3) |
| 3 Explain Anti reflection coating. | (3) |
| 4 Give Rayleigh's criteria for spectral resolution. Illustrate it with figure. | (3) |
| 5 Write the physical significance of wave function. | (3) |
| 6 Why do nanomaterials exhibit properties different from those of their classical counterparts? | (3) |
| 7 State and explain Ampere's circuital law. | (3) |
| 8 State and explain Poynting's theorem. | (3) |
| 9 What are high temperature superconductors? Give two examples. | (3) |
| 10 What are fibre optic sensors? Name two different types. | (3) |

PART B

Answer one full question from each module, each question carries 14 marks

Module-I

- 11 a) Obtain the differential equation of a damped harmonic oscillator and deduce the solution for over damped condition. Show the graphical variations of displacement with respect to time. (10)
- b) The equation of transverse wave travelling along a stretched string is given by, (4)
- $$\psi(x, t) = 10 \sin(2\pi t - 0.01\pi x)$$
- where ψ and x are in cm and t is in second. Find the amplitude, frequency, velocity and wave length.
- 12 a) Derive the differential equation for transverse wave in a stretched string and hence obtain the expression for velocity of the wave. (10)
- b) The frequency of a tuning fork is **200Hz**. If the quality factor **$Q = 5 \times 10^4$** , (4)
- find the time after which its amplitude becomes **1/2** of its initial value.

Module-II

- 13 a) Describe the experimental set up of Newton's ring arrangement. Derive an expression for wavelength of light used. (10)

- b) Light of wavelength **6000Å** falls normally on two glass plates enclosing a wedge shaped film. The plates touch at one end and are separated at **10cm** from that end by a wire. If the bandwidth of the interference pattern is **0.05 mm**, find diameter of the wire. (4)
- 14 a) Give any 3 differences between Fresnel and Fraunhofer classes of diffraction. Discuss diffraction due to grating and derive the grating equation for normal incidence. (10)
- b) What is the highest order spectrum which may be seen with light of wavelength **5×10^{-5} cm** by means of grating with **3000lines/cm**? (4)

Module-III

- 15 a) Write the differential equation for a particle in a one dimensional box and obtain the possible energy values and normalized wave functions. (10)
- b) Calculate the quantum number associated with a marble of mass **10 gm** trapped to move with speed **1m/s** in a one dimensional box of width **20 cm**. (4)
- 16 a) Explain the following (10)
- (i) Nanomaterials (ii) Nano sheets (iii) Nano wires and (iv) Quantum dots.
- b) What are the conditions to be satisfied by a well behaved wavefunction? Write its normalization condition. (4)

Module-IV

- 17 a) Distinguish between paramagnetic and diamagnetic substances with two examples for each. (10)
- b) Calculate induced emf and current in a closed circuit at time, **t = 3s**, if the magnetic flux through it varies with time obeying the equation **$\Phi = t^3 + 2t^2 + 5t$** . The resistance in the circuit is **4 Ω**. (4)
- 18 a) Starting from basic laws of electricity and magnetism, derive Maxwell's equations. (10)
- b) If **$\Phi(x, y, z) = 4x^2y - y^3z^2$** , find the gradient of **Φ** at the point **(1,-1,-1)**. (4)

Module-V

- 19 a) Explain Meissner effect in superconductivity. Distinguish between Type I and Type II superconductors with appropriate diagrams and examples. (10)
- b) Give any four applications of superconductivity. (4)
- 20 a) Explain the propagation of light through an optical fibre. Distinguish between step index and graded index fibres. (8)
- b) Explain fibre optic communication system with a block diagram. (6)
