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, $\boldsymbol{\psi(x,t) = 10\sin(2\pi t - 0.01\pi x)}$ where ψ and x are in cm and t is in second. Find the amplitude, frequency, velocity and wave length. (4)

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 $\mathbf{Q = 5 \times 10^4}$, find the time after which its amplitude becomes **1/2** of its initial value. (4)

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 **6000A°** 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
(i) Nanomaterials (ii) Nano sheets (iii) Nano wires and (iv) Quantum dots. (10)

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)

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