

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester B.Tech Degree Regular and Supplementary Examination December 2020 (2019 Scheme)

Course Code: PHT110**Course Name: ENGINEERING PHYSICS B
(2019 Scheme)**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks.*

Marks

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| 1 | List any six points to compare mechanical and electrical oscillators. | (3) |
| 2 | Derive one dimensional wave equation | (3) |
| 3 | Explain the principle and working of antireflection coatings. | (3) |
| 4 | Distinguish between Fresnel and Fraunhofer classes of diffraction. | (3) |
| 5 | List any two characteristics of matter waves. Find the expression for de Broglie wavelength. | (3) |
| 6 | Define zero, one and two dimensional nanomaterials. | (3) |
| 7 | How echo is different from reverberation? | (3) |
| 8 | Write a note on SONAR. Give any two uses of it. | (3) |
| 9 | Define metastable state and population inversion. | (3) |
| 10 | Differentiate between step index and graded index fibre. | (3) |

PART B*Answer one full question from each module, each question carries 14 marks***Module-I**

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| 11 | a) Frame the differential equation of a damped harmonic motion and obtain its solution. Mention the different cases. | (10) |
| | b) The frequency of a tuning fork is 300Hz . If its Q-factor is 5×10^4 , find the time after which its energy becomes $(1/10)^{\text{th}}$ of its initial value. | (4) |
| 12 | a) Discuss the propagation of a transverse wave along a stretched string and derive the expression for frequency. | (10) |
| | b) A uniform steel wire has length 10m and mass 2 kg . Find the Tension in the string if the speed of transverse wave on the wire is 340m/s . | (4) |

Module-II

- 13 a) Explain the formation of Newton's rings. Obtain the expression for finding the wavelength of light. (10)
- b) An air wedge is formed using two optically plane glass strips of length **15cm**. A spacer of thickness **0.015 mm** is introduced at one end. If the light used is of wavelength **5893Å**, find the separation between consecutive bright fringes. (4)
- 14 a) What is grating? Give the theory of plane transmission grating. How can it be used to find the wavelength of light? (10)
- b) A plane transmission grating has **6000 lines/cm**. It is used to obtain a spectrum of light from sodium lamp in **second** order. Calculate the angular separation between two sodium lines of wavelength **5890 Å** and **5896 Å**. (4)

Module-III

- 15 a) Starting from a plane wave equation, obtain Schrodinger's time dependent equation, by using de Broglie's formula and Einstein's relation for photon energy. (9)
- b) Using position - momentum uncertainty relation show that electrons cannot exist in the nucleus. (5)
- 16 a) Explain the mechanical, electrical and optical properties of nanomaterials. (9)
- b) Mention any five applications of nanotechnology. (5)

Module-IV

- 17 a) Explain the terms absorption coefficient and reverberation time. What is the significance of reverberation time? Discuss the factors on which the reverberation time depends and write the Sabine's formula. (10)
- b) A hall has dimensions of **25m×20m×8m**. The reverberation time is **4s**. Determine the average absorption coefficient of the surfaces. (4)
- 18 a) What is meant by magnetostriction effect? Give two examples for magnetostrictive materials. Explain the production of ultrasonic waves by magnetostriction method. Mention any two medical applications of ultrasonic waves. (10)
- b) A quartz crystal of **2mm** is vibrating at resonance. Calculate the fundamental frequency of vibration, if Young's modulus of quartz is **8.5X10¹⁰ N/m²** and density **3000Kg/m³**. (4)

Module-V

- 19 a) Explain construction and working of Ruby laser. (10)
b) Describe the recording of hologram (4)
- 20 a) Define numerical aperture of an optical fibre. With a neat diagram derive an expression for numerical aperture of a step index fibre. (10)
b) The sum of refractive indices of core and cladding is **2.9** and difference is **0.03**. Determine numerical aperture and acceptance angle of optical fibre. (4)
