

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech S1 (Special Improvement) Examinations January 2021 (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 | Draw the displacement – time curves for all types of damped harmonic oscillators and write the conditions. | (3) |
| 2 | List two differences between longitudinal and transverse waves. Give an example for each. | (3) |
| 3 | Explain colours of thin films. | (3) |
| 4 | What is Rayleigh's criterion of spectral resolution? | (3) |
| 5 | State and explain Heisenberg's uncertainty principle. | (3) |
| 6 | What is the significance of surface to volume ratio in nanomaterials? | (3) |
| 7 | What is echelon effect? How it can be resolved? | (3) |
| 8 | What is magnetostriction effect? Give two examples for magnetostrictive materials. | (3) |
| 9 | Give any three properties of laser. | (3) |
| 10 | Write a short note on intensity modulated sensor. | (3) |

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

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|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 11 | a) Formulate the differential equation of a forced harmonic motion. Find the expressions for its amplitude and phase. | (10) |
| | b) A damped oscillator of mass 2g has a force constant 10 N/m and damping constant 2 s⁻¹ . Find the angular frequency with and without damping. | (4) |
| 12 | a) What is a one dimensional wave and derive the one dimensional wave equation. Define wavelength, time period, frequency and wave velocity. Also obtain expressions for them. | (10) |
| | b) A string of mass 0.65 kg is stretched between two supports 30 m apart. If the | (4) |

tension in the string is **160 N**, find the velocity of the wave in the string? How long will a pulse take to travel from one support to the other?

Module-II

- 13 a) With necessary theory, describe an experiment to determine the diameter of a thin wire using airwedge. (10)
- b) A non-reflecting film is to be deposited on a glass surface. What would be the minimum thickness for zero reflection for a light of wavelength **550 nm**? μ for the film is **1.334**. (4)
- 14 a) Give the theory of plane transmission grating and explain intensity distribution. Also define dispersive power and resolving power of grating. (10)
- b) In Newton's rings experiment the diameters of the **4th** and **12th** dark rings are **0.4cm** and **0.7cm** respectively. Deduce the diameter of **20th** dark ring. (4)

Module-III

- 15 a) Write the Schrodinger's equation for a particle in a one dimensional potential well and obtain energy eigen values. (10)
- b) Compute the de Broglie wavelength of an electron with kinetic energy **4.5 keV**. (4)
- 16 a) What are nanomaterials? Explain the optical, electrical and mechanical properties of nanomaterials. (10)
- b) A microscope using photons is employed to locate an electron in an atom within a distance of **0.2 Å**. What is the minimum uncertainty in the momentum of the electron located in this way? (4)

Module-IV

- 17 a) Explain reverberation and reverberation time. What is the significance of reverberation time? Write down Sabine's formula for evaluating reverberation time and explain the terms. (10)
- b) What is threshold of hearing and threshold of pain intensity? Give their values. (4)
- 18 a) With a neat diagram explain how the velocity of ultrasonic waves can be determined using ultrasonic diffractometer. (10)
- b) Find the frequency of ultrasonic waves that can be generated by a nickel rod of length **4cm** (Young's modulus of nickel = **207GPa** and density = **8900 kg/m³**). (4)

Module-V

- 19 a) Explain the terms spontaneous emission, stimulated emission, population inversion, and metastable state with respect to a laser system. (8)

- b) Describe with figure the construction and reconstruction of a hologram. (6)
- 20 a) Develop an expression for numerical aperture of a step index fibre. Explain the fibre optic communication system with block diagram. (10)
- b) An optic fibre has core of refractive index **1.6** and cladding of refractive index **1.58**. If this fibre is immersed in a liquid of refractive index **1.4**, evaluate numerical aperture and acceptance angle. (4)
