

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester B.Tech Degree Regular and Supplementary Examination December 2023 (2019 Scheme)

Course Code: PHT 100**Course Name: ENGINEERING PHYSICS A
(2019 -Scheme)**

Max. Marks: 100

Duration: 3 Hours

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

Marks

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| 1 | Draw amplitude response curves for a forced harmonic oscillator with low, medium and high damping. Label them accordingly. | (3) |
| 2 | List the parameters of a driven LCR circuit that are analogous to the mass, force constant and damping coefficient of a mechanical oscillator. | (3) |
| 3 | What will happen to the diameter of the rings when Newton's rings arrangement is immersed in a liquid? Explain. | (3) |
| 4 | Distinguish between Fresnel and Fraunhofer diffraction. | (3) |
| 5 | List any two characteristics of matter waves. Write the expression of de-Broglie wavelength. | (3) |
| 6 | List three medical applications of Nano Technology. | (3) |
| 7 | Derive a relation between relative permeability and susceptibility. | (3) |
| 8 | State and explain Poynting's theorem. | (3) |
| 9 | Define critical temperature and critical magnetic field. | (3) |
| 10 | What is a light emitting diode? Give its working principle. | (3) |

PART B*Answer one full question from each module, each question carries 14 marks.***MODULE 1**

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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 fundamental frequency. | (10) |

- b A uniform steel wire has length **10m** and mass **2 kg**. Find the Tension in the string (4)
if the speed of transverse wave on the wire is **340m/s**.

MODULE 2

- 13 a Discuss with necessary theory, the formation of interference pattern in a thin film (10)
by reflected light. Obtain the conditions for brightness and darkness.
- b In Newton's rings experiment the diameters of 5th and 15th dark rings are 0.4 cm (4)
and 0.6 cm respectively. If radius of curvature of the lens is 100 cm find the
wavelength of the light used.
- 14 a Explain the construction of a grating. Write down the grating equation. Explain (10)
the difference in diffraction pattern obtained when a monochromatic light is
replaced by white light.
- b The sodium yellow doublet has wavelengths 589 nm and 589.6 nm. What should (4)
be the resolving power of the grating to resolve these lines?

MODULE 3

- 15 a Obtain the energy eigen values and eigen functions for a particle confined in a one (10)
dimensional infinite square well potential.
- b An electron is accelerated through a potential difference of 200V. Find the de- (4)
Broglie wavelength.
- 16 a Explain Optical, Electrical and Mechanical properties of nano materials. (10)
- b Explain significance of surface area to volume ratio in nano scale. (4)

MODULE 4

- 17 a Distinguish between paramagnetic and ferromagnetic substances with two (10)
examples for each.
- b Calculate the magnetic susceptibility of a paramagnetic substance at 600 K, if its (4)
susceptibility at 200 K is 3.756×10^{-4} .
- 18 a Starting from Maxwell's equations show that velocity of electromagnetic waves in (10)
free space is $1/(\mu_0\epsilon_0)^{1/2}$.
- b State Gauss' divergence theorem and Stoke's theorem. (4)

MODULE 5

- 19 a Explain the characteristics of Type I and Type II superconductors with appropriate (10)
diagrams and examples. Give any four applications of superconductors.
- b Write a note on high temperature superconductors. (4)

- 20 a Define numerical aperture and acceptance angle of an optical fibre and derive the expression for numerical aperture of a step index fibre with a neat diagram. (10)
- b The numerical aperture of an optic fibre is 0.295 and refractive index of core is 1.54. Calculate refractive index of cladding and acceptance angle. (4)
