

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018**  
 (Regular & Supplementary)

**Course Code: PH100**

**Course Name: ENGINEERING PHYSICS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each question carries 2 marks.*

Marks

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|----|--|-----|
| 1  | What will happen to fundamental frequency of the wave in a stretched string when tension of the string increases 4 times and its length reduced to half the original length? | (2) |
| 2  | What is meant by sharpness of resonance?   | (2) |
| 3  | How an antireflection coating is constructed?  | (2) |
| 4  | When slit width increases, what will happen to central maximum? Why?   | (2) |
| 5  | Explain the phenomenon double refraction.  | (2) |
| 6  | Superconductor is a perfect diamagnet. Justify.  | (2) |
| 7  | A well-behaved wave function is normalised. Why?   | (2) |
| 8  | What is Tunnel effect? What is quantum mechanical Tunnelling?  | (2) |
| 9  | What is threshold hearing intensity?   | (2) |
| 10 | What is piezoelectric effect?  | (2) |
| 11 | How holography differs from photography?   | (2) |
| 12 | What is Photovoltaic effect?   | (2) |

**PART B**

*Answer any 10 questions, each question carries 4 marks.*

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|----|---|-----|
| 13 | Point out any four similarities between electrical and mechanical oscillators   | (4) |
| 14 | A parallel beam of light ( $\lambda = 600\text{nm}$ ) falls on a glass plate ( $\mu = 1.5$ ) at an angle of incidence $30^\circ$ . Calculate smallest thickness of the plate so that it will appear dark by reflection.   | (4) |
| 15 | Explain different force components acting on a forced and damped harmonic oscillator and establish the differential equation of forced harmonic oscillator  | (4) |
| 16 | A grating is illuminated at normal incidence. At an angle of diffraction $45^\circ$ a certain order of light of wavelength 500 nm is superimposed on another one of wavelength 400 nm in the next higher order. Evaluate the number of lines per meter of the grating used. | (4) |
| 17 | Linearly polarized light is changed into circularly polarized light after passing through a slice of crystal $2.5 \times 10^{-5}$ m thick. Find the wavelength of light used, if the difference in refractive indices for ordinary and extraordinary rays is 0.005.         | (4) |
| 18 | Compare Type I and Type II superconductors.   | (4) |
| 19 | An electron and a proton are moving with same kinetic energy. Which one has shorter wavelength. Why?  | (4) |

- 20 What should be the minimum size of cell in phase space according to classical and quantum mechanics? (4)
- 21 A quartz crystal of length 2mm is vibrating at resonance. Calculate the fundamental frequency of vibration, if Young's modulus  $Y = 8.5 \times 10^{10} \text{ N/m}^2$  and density  $= 3000 \text{ kg/m}^3$ . (4)
- 22 A cinema hall has a volume of  $8000 \text{ m}^3$ . It is required to have a reverberation of 2s. What should be the total absorption of the hall? (4)
- 23 Point out the differences between spontaneous emission and stimulated emission. (4)
- 24 Why fiber optic communication system is preferred over other types of communication techniques. (4)

### PART C

*Answer any three questions, each question carries 6 marks.*

- 25 Write down differential equation for a damped harmonic oscillator and obtain its solution. Show that, in underdamping condition, amplitude is an exponentially decaying quantity. (6)
- 26 Show that the radii of different dark rings in Newton's Rings are proportional to square root of integers. Explain with necessary theory, how the refractive index of the given liquid is determined using Newton's Rings arrangement. (6)
- 27 Distinguish between positive and negative crystals. Explain the construction of quarter wave plate and half wave plate. Also obtain the expressions for their thickness. (6)
- 28 State uncertainty principle and explain why electrons cannot be present in the nucleus. (6)

### PART C

*Answer any three questions, each question carries 6 marks.*

- 29 Express the numerical aperture of a step index fiber in terms of the refractive index of core and cladding. Also write any two technological applications of optical fibres. (6)
- 30 Explain the production of ultrasonic waves by magnetostriction method. (6)
- 31 Explain the terms reverberation and reverberation time. Discuss the factors on which the reverberation time depends on, and deduce Sabine's formula. (6)
- 32 Explain the principle involved in photo detection. Describe the working of any two commonly used photo detectors. (6)

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