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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester B.Tech Degree Examination July 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

1 Mention three cases of damping. Draw their displacement –time graphs. (3)

2 Write the three dimensional wave equation and its solution. (3)

3 Explain, with the help of the relevant equation, why the centre of a Newton's rings system appears dark in reflected light. (3)

4 Define dispersive power of grating. Write its expression. (3)

5 What is quantum mechanical tunnelling? Name two electronic devices based on this phenomena. (3)

6 Mention any three applications of nanotechnology. (3)

7 Differentiate between musical sound and noise. (3)

8 Write a note on non destructive testing. Give an example for non destructive testing method. (3)

9 Differentiate between spontaneous emission and stimulated emission. (3)

10 Draw the block diagram of fibre optic communication system. (3)

PART B

Answer one full question from each module, each question carries 14 marks

Module-I

11 a) Derive the differential equation of a forced harmonic oscillator and obtain the expression for its amplitude. (10)

b) The amplitude of an underdamped oscillator reduces to $(1/10)^{th}$ of its initial value after **100** oscillations. Its time period is **1.15**s. Calculate the damping constant and relaxation time. (4)

12 a) Derive the expression for velocity of transverse waves in a uniform stretched string. (10)

b) A travelling wave propagates according to the expression $y= 0.003\sin(3x-2t)$ (4)

where y is the displacement at position x and time t , x and t are in SI units. Determine amplitude, wavelength , frequency and period of the wave.

Module-II

13 a) Explain the formation of interference fringes in air wedge and obtain the expression for bandwidth. (10)

b) Newton's rings are observed in reflected light of wavelength **5.9×10^{-7} m**. The diameter of the **10^{th}** dark ring is **0.005m**. Find the radius of curvature of the lens and thickness of air film. (4)

14 a) Explain Rayleigh's criterion for spectral resolution. Discuss the theory of Fraunhofer diffraction at a plane transmission grating. Derive the condition for diffraction maxima (the grating equation). (10)

b) A diffraction grating under normal illumination gives coinciding maxima of consecutive order for wavelengths **600nm** and **500nm** at **30^0**. Find the number of lines per centimetre of the grating. (4)

Module-III

15 a) Find the energy Eigen values and Eigen function of a particle moving in a one dimensional box. (10)

b) An electron is confined to move in a one dimensional potential box of width **5Å.** Calculate the energies corresponding to the first and second quantum states in**eV**. (4)

16 a) What are zero, one, and two dimensional nanomaterials? Explain the mechanical, electrical and optical properties of nanomaterials. (9)

b) Compare the uncertainty in velocities of an electron and proton moving in a one dimensional box of width **100Å.** **($m_e = 9.1X10^{-31}$kg & $m_p = 1.67X10^{-27}$ kg)** (5)

Module-IV

17 a) Define absorption coefficient. What are thefactors affecting acoustics of a building? Give remedies. (10)

b) The dimensions of an auditorium are **60m×15m×10m** and its interior surface have an average absorption coefficient of **0.25**. Find the reverberation time. (4)

18 a) What is meant by piezoelectric effect? Give two example for piezoelectric crystals. Explain the production of ultrasonic waves using piezoelectric oscillator. (10)

b) An ultrasonic wave of **0.09 MHz** sends down a pulse towards the sea bed (4)

which returns after **0.55 seconds**. The velocity of sound in sea water is**1800 m/s**.Calculate the depth of the sea and wavelength of the pulse.

Module-V

19 a) With a neat diagram explain the construction and working of He-Ne laser. (10)

b) Explain the reconstruction of a hologram (4)

20 a) Explain the principle of optical fibre cable. Distinguish between step index fibre and graded index fibre with neat diagrams. Give any four applicationof optical fibres. (10)

b) Calculate the numerical aperture and acceptance angle of a fibre with a core of refractive index **1.54** and that of cladding**1.50**. The fibre is immersed in water.(refractive index **1.33**) (4)

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