B

10001

Reg. No.:_____ Name: _____

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2016

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

Part A

Answer ALL questions. Each question carries 2 marks

1. What do you mean by quality factor of an oscillator?
2. What is the relation between path difference and phase difference in wave motion?
3. Two independent sources of light cannot produce interference fringes. Why?
4. Define dispersive power of a grating.
5. Distinguish between plane polarized light and unpolarized light.
6. What is Meissner effect?
7. What is phase space?
8. What is the probability interpretation of wave function?
9. What is the relation connecting reverberation time and total absorption?
10. What is magnetostriction effect?
11. Write any two advantages of Hologram over photographic images.
12. Distinguish between Step index fibre and Graded index fibre.

Part B

Answer any 10 questions. Each question carries 4 marks

13. Compare an electrical and mechanical oscillator.
14. A transverse wave on a stretched string is described by $y(x, t) = 4.0 \sin (25t+0.016x+\pi/3)$ where x and y are in cm and t is in second.
    Obtain the (i) Speed (ii) Amplitude (iii) Frequency and(iv)Initial phase at the origin.
15. With Newton's rings arrangement, nth dark ring formed by light of wavelength 6000 A^0 coincides with the $(n+1)^{th}$ dark ring for light of wavelength 4500A^0. If the radius of curvature of the convex surface is 90 cm, find the diameter of the nth ring for light wavelength 6000 A^0.
16. A plane transmission grating has 6000 lines/cm. Find the angular separation between two wavelengths 500 nm and 510 nm in the 3rd order.

17. The refractive index of calcite is 1.658 for ordinary ray and it is 1.486 for extraordinary ray. A slice having thickness 0.9×10^{-4}cm is cut from the crystal. For what wavelengths this slice will act as a (i) Quarter wave plate. (ii)Half wave plate
18. Distinguish between type I and type II super conductors with examples.
19. Calculate the de Broglie wavelength of electron whose kinetic energy is 10keV.
20. Distinguish between Macrostate and Microstate of a system
21. The volume of a hall is $3000m^3$. It has a total absorption of $100m^2$sabine. If the hall is filled with audience who add another $80m^2$sabine, then find the difference in reverberation time.
22. What is NDT? How ultrasonic wave is used for NDT.
23. What is the difference between Spontaneous emission and Stimulated emission?
24. What is a LED? Give its working principle.

Part-C

Answer any 3 questions. Each question carries 6 marks.

25. Considering the transverse vibration in a stretched string, derive the differential equation of one-dimensional wave.
26. Light from a monochromatic source is allowed to fall on a single slit. Two lenses are given. With the help of a neat diagram write the experimental set up for obtaining the diffraction pattern. Deduce the conditions for getting bright and dark regions on the screen. Also obtain the width of central maximum.
27. How a Nicol prism can be constructed from a calcite crystal? How can it be used as a polarizer and as an analyzer?
28. Formulate Schrodinger's time dependent equation starting from a plane wave equation by using de Broglie's formula and Einstein's relation for photon energy.

Part-D

Answer any 3 questions. Each question carries 6 marks.

29. With a neat diagram explain how ultrasonic waves are produced by piezoelectric oscillator
30. What are the factors affecting the acoustics of a building?
31. Outline the principle and working of Ruby Laser.
32. Define numerical aperture of an optical fibre and derive an expression for NA of a step index fibre.

10051

B

Reg. No. : ..... Name : .....

SECOND SEMESTER B.TECH. DEGREE EXAMINATION, MAY/JUNE 2016

PH 100 : ENGINEERING PHYSICS

Max. Marks : 100 Duration : 3 Hours

PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. Distinguish between free oscillation and damped oscillation.
2. State the laws of transverse vibrations of a stretched string.
3. What do you mean by optical path ?
4. What is grating element ? Write the grating equation in terms of grating element.
5. What is a Retardation plate ? Write the expression for the thickness of a QWP and HWP.
6. What is DC Josephson effect ?
7. How do you account for the natural line broadening on the basis of Heisenberg's Uncertainty principle ?
8. What do you mean by Fermi energy level and Fermi energy ?
9. Distinguish between reverberation and echo.
10. How ultrasonic waves are detected by thermal method ?
11. How population inversion is achieved in Ruby laser ?
12. Explain the principle of propagation of light through an optical fibre. **(12×2=24)**

P.T.O.

PART – B

Answer **any 10** questions. **Each** question carries **4** marks.

13. What are the conditions for oscillations of a harmonic oscillator to be over damped, critically damped and under damped ? Compare the time – displacement curve in the three cases.

14. A piece of wire 50 cm long is stretched by a load of 2.5 kg and has a mass of 1.44 g. Find the frequency of the second harmonic.

15. Light of wave length 6000 Å falls normally on two glass plates enclosing a wedge shaped film. The plates touch at one end and are separated at 10 cm from that end by a wire. If the bandwidth of the interference pattern is 0.05 mm, find the diameter of the wire.

16. Light of wave length 589.3 nm is incident normally on a plane transmission grating having 6000 lines/cm. Calculate the angle at which the principal maxima of the first order is formed.

17. How do you distinguish circularly polarized light from un polarized light ?

18. Write any four applications of superconductors.

19. What are the conditions to be satisfied by a wave function ?

20. What is phase space ? With the help of Heisenberg's Uncertainty relation, show that the minimum size of the unit cell in quantum statistics is hf, where h is the Planck's constant and f is the degree of freedom of the system.

21. The dimensions of an auditorium are 60 m × 15 m × 10 m and its interior surfaces have an average absorption co-efficient of 0.25.Find the reverberation time of the auditorium.

22. Given that the velocity of ultrasonic waves in sea water is equal to 1440 m/s. Find the depth of a submerged submarine, if ultrasonic pulses reflected from the submarine is received 0.33 s after sending ultrasonic waves.

23. With the help of a neat diagram explain how a hologram is recorded.

24. A fibre cable has an acceptance angle of 30° and a core of refractive index 1.4. Calculate the refractive index of the cladding. **(10×4= 40)**

PART – C

Answer **any 3** questions. **Each** question carries **6** marks.

25. Write the differential equation of a forced harmonic oscillator and write its solution. Derive the expression for the amplitude and phase difference in terms of the natural frequency of the body and frequency of applied periodic force.

26. Derive the expression for the diameter of the n^{th} dark ring in Newton's ring interference pattern. With necessary equations explain briefly the experimental procedure to determine the refractive index of a liquid.

27. With the help of a neat diagram of the principal section of a nicol prism write how it produces plane polarized light and how it can be used for the analysis of plane polarized light ?

28. Compare M-B, B-E and F-D statistics. **(3×6=18)**

Answer **any 3** questions. **Each** question carries **6** marks.

29. What are ultrasonic waves ? Write the principle of production of ultrasonic waves by magnetostriction effect. Draw the circuit diagram of the magnetostriction oscillator. Write any two applications of ultrasonic waves.

30. Define intensity of sound wave. Write the expression for the SIL in dB scale. Distinguish between threshold minimum intensity and threshold pain intensity.

31. "Lasing medium with metastable state, optical resonator, and pumping mechanism are the essential requirements of a laser". How it is satisfied in He-Ne laser ?

32. With a block diagram explain fibre optic communication system. **(3×6 =18)**

B

10003

Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, JULY 2016

PH100 ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

Part-A

Answer all questions. Each question carries 2 marks.

1. What is the effect of damping on the frequency and time period of an oscillator?
2. Distinguish between longitudinal waves and transverse waves.
3. Write the expression for the radius of the n^{th} dark ring in Newton's rings interference pattern. What happens to this radius when air is replaced by a liquid of refractive index μ.
4. Define resolving power of grating.
5. What is a half wave plate? Write the expression for its thickness.
6. What is DC Josephson effect?
7. What is quantum mechanical tunnelling?
8. What do you mean by Fermi level of a system?
9. Define absorption co-efficient of sound.
10. What is piezo electric effect?
11. What is metastable state. How it is significant in the production of laser?
12. What is a phototransistor?

Part-B

Answer any 10 questions. Each question carries 4 marks

13. What is the condition for over damping in the case of a damped harmonic oscillator? With the help of displacement-time graph write how this condition affect the amplitude of the oscillator?
14. A string when stretched by a weight of 4kg gives a note of frequency 256 Hz. What weight will produce a frequency twice the above frequency?
15. What is an interference filter? How is it constructed?
16. A parallel beam of monochromatic light falling normally on a diffraction grating produces a deviation of $14^0\ 43^I$ in the second order. If the grating has 5200 lines/cm calculate the wavelength of the monochromatic radiation.
17. A plane polarized light of λ=6000Å is incident on a quartz crystal and parallel to the axis. If the refractive indices of the crystal for ordinary and extraordinary ray are 1.544

and 1.553, then find the least thickness for which the ordinary and extraordinary rays combines and emerge as plane polarized light.

18. What is Meissner effect? Show that a super conductor is a perfect diamagnet.
19. The time gap between the excitation of an atom and emission of radiation is $\Delta t=10^{-8}$ second. Find the uncertainty in the frequency of radiation.
20. Write three important postulates of Fermi-Dirac Statistics. Also write its distribution equation.
21. A cinema hall has a volume of 10000 m^3. It is required to have a reverberation time of 2 seconds. What should be the total absorption of the hall?
22. Calculate the frequency of ultrasonic waves that can be generated by a nickel rod of length 4cm. (Young's modulus of nickel = 207 GPa and density of nickel 8900 kg/m^3).
23. Calculate the ratio of spontaneous to stimulated emission by an incandescent bulb at 2000 K. Take frequency= 6×10^{14} Hz. Boltzmann Constant k = 1.38×10^{-23} J/K.
24. What are Fibre optic sensors? Name two different types.
25.

Part-C

Answer any 3 questions. Each question carries 6 marks.

26. Frame and solve the differential equation of a forced harmonic oscillator.
27. With necessary theory write the formation of interference pattern in an air wedge and derive an expression for the bandwidth.
28. You are provided with two nicols and a quarter wave plate. How will you produce plane polarized, circularly polarized and elliptically polarized light.
29. State Uncertainty principle. With the help of it, explain the absence of electrons inside the nucleus.

Answer any 3 questions. Each question carries 6 marks.

30. Name and explain two methods for the detection of ultrasonic waves. Name any four medical applications of ultrasonic waves.
31. What is reverberation and reverberation time? What is its significance? Write the factors on which the reverberation time depends. Write Sabine's formula.
32. Outline the principle and working of He-Ne laser.
33. What is the principle of holography? How is a hologram recorded? Write any two applications of holography.

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B

10005

Reg. No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE SPECIAL EXAMINATION, AUGUST 2016

PH100 ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

Part-A

Answer all questions. Each question carries 2 marks.

1. What is a forced oscillator?
2. What are the factors on which the frequency of vibration of a stretched string depends?
3. Write the principle of superposition of waves.
4. What is grating element. How it is related with the number of lines drawn per unit length of the grating.
5. What is double refraction?
6. What is Meissner effect?
7. Write the normalization condition of a wave function and its significance.
8. What is the minimum size of a cell in phase space in Quantum Statistics? What is the probability of occupancy for the Femi level at non zero absolute temperature?
9. The absorption co- efficient of open window is one. Justify the statement.
10. Mention any four applications of ultrasonic waves.
11. Name four outstanding characteristics of Laser.
12. Name the two different types of fibre optic sensors.

Part-B

Answer any 10 questions. Each question carries 4 marks

13. Compare electrical and mechanical oscillating systems.
14. Equation of transverse wave travelling along a string is $y = 4\sin\pi(0.010x - 2.0t)$ where x and y are in centimetres and t is in second. Find (i)Amplitude (ii)Wavelength (iii)Initial phase at the origin and (iv)Frequency of the wave
15. With the help of Cosine law, how can you account for the colours of thin films?
16. What is the highest order of spectrum which may be seen with light of wavelength 5 X 10^{-5}cm by means of grating with 3000 lines/cm.

17. Calculate the thickness of a doubly refracting crystal required to introduce a path difference of $\lambda/2$ between the ordinary and extra ordinary rays. Given λ=6000 A^0, μ_0=1.544, μ_e=1.5533.
18. What is super conductivity? Define transition temperature and critical magnetic field.
19. What is the significance of operators in Quantum mechanics? What is Hamiltonian operator? Write its expression.
20. Write any four assumptions of Maxwell - Boltzmann Statistics.
21. Calculate the reverberation time of a hall having volume 4000m^3 and total sound absorption of 160 m^2 sabine.
22. An ultrasonic source of 0.09 MHz sends down a pulse towards the sea bed which returns after 0.55 second. The velocity of sound in water is 1800 m/s. Calculate the depth of the sea and wave length of the pulse.
23. What is population inversion? How it can be achieved?
24. Name the principle behind the propagation of light through an optic fibre. How the essential conditions for this phenomenon is satisfied in optic fibres. List three advantages of fibre optic communication.

Part-C

Answer any 3 questions. Each question carries 6 marks

25. Derive one-dimensional wave equation and write its solution.
26. With the help of a diagram, deduce the conditions for darkness and brightness in the case of Fraunhofer diffraction at a single slit. Obtain the width of central maximum.
27. How a Nicol prism can be constructed from a calcite crystal. How can it be used as a polarizer and analyzer?
28. Write the Schrodinger equation for a particle in one dimensional infinite square well potential and derive the normalized wave function.

Answer any 3 questions. Each question carries 6 marks.

29. How can you produce ultrasonic waves using piezoelectric oscillator.
30. Explain the factors affecting the acoustics of a building.
31. "Laser is light amplification by stimulated emission of radiation." Define the terms absorption, spontaneous emission and stimulated emission. Derive the relation between Einstein coefficients.
32. What is a hologram? How can it be re- constructed? Write any 2 advantages of holograms over photographic images.

B **B1B001** **Total Pages:2**

Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B TECH DEGREE EXAMINATION JANUARY 2017

Course Code**: PH 100**

Course Name**: ENGINEERING PHYSICS**

Maximum Marks : 100 Duration : 3 hours

PART A

Answer all questions. Each question carries 2 marks

1. What is resonance in forced oscillation? Give one example.
2. Distinguish between transverse and longitudinal waves with examples.
3. What are coherent sources?
4. Why diffraction of light is not as evident in daily experience as that of sound waves?
5. What are positive and negative uniaxial crystals?
6. Define critical magnetic field in superconductors? How this is related to the temperature of superconductor?
7. What is meant by wave function? Write its normalization condition.
8. What are bosons and fermions? Give examples.
9. Define reverberation and reverberation time.
10. Mention any two medical applications of ultrasonic waves.
11. What is a laser? What are the three requisites for laser action to take place?
12. Distinguish between an LED and a semiconductor laser.

PART B

Answer any 10 questions. Each question carries 4 marks

13. What is a damped harmonic oscillator? Draw the graph showing the variation of amplitude with time in case of over damped, critically damped and under damped case of an oscillator by clearly marking the conditions for the above cases in the graph itself.
14. The equation of a transverse vibration of a stretched string is given by

    $y = 1.5 \times 10^{-3} \sin\left(\frac{2\pi}{8}x - 80\pi t\right)$

    Where x is measured in metres and t in seconds. Evaluate (i) Amplitude (ii) Wavelength (iii) Frequency and (iv) Velocity of wave?
15. If the diameter of n^{th} dark ring in an arrangement giving Newton's rings changes from 0.03m to 0.025m as a liquid is introduced between the lens and plate, what is the value of refractive index of the liquid?
16. A parallel beam of monochromatic light of wavelength 589.6 nm from a narrow slit is diffracted by a plane transmission grating containing 6000 lines/cm, placed normal to the beam. Calculate the angle at which the second order diffracted images of the slits will be observed.

17. Calculate the thickness of (i) a quarter wave plate (ii) a half wave plate. Given $\mu_e = 1.553$ and $\mu_o = 1.553$ and $\lambda = 5000Å$.
18. What is Meissner effect? Prove that a superconductor acts as a perfect diamagnet.
19. An electron confined in an one dimensional box of width 'L' is known to be in its first excited state. Determine the probability density of electron in the central half.
20. Distinguish between Bose-Einstein statistics and Fermi- Dirac statistics.
21. The area of interior surface of an auditorium is 3340 m^2. Its reverberation time is 1.5 seconds. If average absorption coefficient of interior surface is 0.4, find the volume of auditorium.
22. With a neat circuit diagram explain the working of a Piezoelectric Oscillator to produce ultrasonic waves.
23. What type of pumping method is used in ruby laser? Draw the energy level diagram of a ruby laser.
24. Mention any four applications optical fibre.

PART C

Answer any 3 questions. Each question carries 6 marks

25. Derive an expression for the velocity of transverse waves in stretched uniform string.
26. Obtain an expression for fringe width in wedge shaped thin film.
27. Distinguish between type I and type II superconductors with relevant graphs.
28. State Heisenberg's uncertainty principle. Write its mathematical form for the following pairs of variables (i) position and momentum (ii) energy and time (iii) angular position and angular momentum. How this principle can be used to prove the absence of electrons inside the nucleus of an atom.

PART D

Answer any 3 questions. Each question carries 6 marks.

29. What are the basic requirements of an acoustically good hall?
30. What are NDT and SONAR? How ultrasonic waves are used in it?
31. What is holography? How is it different from ordinary photography? Draw the diagrams illustrating the recording and reconstruction of a hologram.
32. With a neat diagram obtain an expression for the numerical aperture of an optical fibre.

Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER B TECH DEGREE EXAMINATION, MAY 2017

PH 100: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 2 marks.

1. Explain two practical cases of damping.
2. Distinguish between longitudinal waves and transverse waves.
3. How can you test the planeness of surfaces using an air wedge?
4. Distinguish between Fresnel and Fraunhofer diffraction.
5. What is a half wave plate? Write the equation for its thickness.
6. What is Meissner effect?
7. Give the probability interpretation of the wave function.
8. What are bosons and fermions? Give examples.
9. What is absorption coefficient of sound?
10. What is inverse piezoelectric effect?
11. Explain population inversion and metastable level in a laser.
12. What is an avalanche photodiode?

PART B

Answer any 10 questions. Each question carries 4 marks.

13. Derive an equation for the velocity of propagation of the waves for transverse vibrations of a stretched string.
14. In a Newton's rings experiment the diameters of the 4^{th} and 12^{th}dark rings are 0.4 cm and 0.7 cm respectively. Find the diameter of the 20^{th} dark ring.
15. Derive the differential equation of damped harmonic oscillation.
16. A plane transmission grating having 5×10^5 lines per metre is used at normal incidence. Calculate the angular separation, in the second order, between the two sodium lines of wavelengths 589 nm and 589.6 nm.
17. Describe the experimental procedure for producing circularly and elliptically polarized light.
18. What is a SQUID? Mention some important applications of SQUIDs.
19. Explain the absence of electrons in the nucleus on the basis of the uncertainty principle.
20. What are the important postulates of Maxwell-Boltzmann statistics?

21. The volume of a room is 500 m^3. The wall area of the room is 250 m^2 and the floor area is 150 m^2. The average sound absorption coefficient of the wall is 0.03, the floor is 0.05 and the ceiling is 0.8. Calculate the reverberation time.
22. A nickel rod of length 10 cm is used in a magnetostriction oscillator. Calculate the frequency of ultrasonic waves generated. Young's modulus of nickel is 210 x 10^9 N/m^2 and density of nickel is 8900 kg/m^3.
23. Explain the process of recording and reading a hologram.
24. With a block diagram, explain the working of an optical communication system.

PART C

Answer any three questions. Each question carries 6 marks.

25. Frame the differential equation of a forced harmonic oscillator and obtain its solution.
26. With the help of a neat diagram, explain the formation of diffraction pattern with a single slit. Deduce the equations for the bright and dark fringes and the width of the central maxima.
27. With a neat diagram explain how a nicol prism is constructed. Describe how it produces plane polarized light.
28. Write down the Schrodinger equation for a particle in a one dimensional infinite square well potential and obtain the equation for wave function of the particle.

PART D

Answer any three questions. Each question carries 6 marks.

29. Explain the thermal method of detection of ultrasonic waves. Describe one method of non destructive testing using ultrasonic waves. Mention four medical applications of ultrasonic waves.
30. What are the characteristics of musical sound? What are the factors affecting acoustics of a building?
31. What are the basic components of a laser system? How are these requirements satisfied in the case of a Ruby laser?
32. Define numerical aperture of an optic fibre. Obtain an expression for the numerical aperture of a step index fibre.

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Total Pages: 2

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks.

1 Define resonance. Give one practical example of resonance.
2 State the laws of transverse vibrations of a stretched string.
3 Distinguish between geometrical path and optical path.
4 Explain Rayleigh's criterion for the resolution of spectral lines.
5 Distinguish between plane polarized light and un-polarized light.
6 Show that superconductors are perfect diamagnets.
7 What is the physical significance of wave function?
8 What is Fermi energy?
9 What is the relation connecting reverberation time and total absorption?
10 What is meant by non-destructive testing of materials?
11 Distinguish between spontaneous and stimulated emission.
12 What is the physical meaning of numerical aperture?

PART B

Answer any 10 questions, each carries 4 marks.

13 Compare a mechanical oscillator with an electrical oscillator.
14 Derive the differential equation of one dimensional wave and deduce its solution.
15 Newton's rings are observed in the reflected light of wavelength 5900 Å. The diameter of tenth dark ring is 0.5 cm. Find the radius of curvature of the lens used.
16 Light of wavelength 5000 Å is incident normally on a plane transmission grating. Find the difference in the angle of deviation in the first and third order spectra. The number of lines per cm on the grating surface is 6000.
17 What is the principle of the working of a Nicol prism. Describe the method of construction of a Nicol prism.
18 Mention four important applications of super conductors.
19 Derive Schrodinger's time dependent equation for a particle.
20 What is phase space? Show that the volume of the unit cell in phase space of quantum state is h^3.
21 The dimensions of an auditorium are 60m X 15m X 10M and its interior surface have an average absorption co-efficient of 0.25. Find the reverberation time of the auditorium?

22 An ultrasonic source of 0.09 MHz sends down a pulse towards the sea bed which returns after 0.55 sec. The velocity of sound in sea water is 1800 m/sec. Calculate the depth of the sea and the wave length of the pulse.

23 Explain the recording and reconstruction of hologram.

24 Calculate the numerical aperture and acceptance angle of a fibre with a core index of 1.54 and a cladding index of 1.50 when the fibre is inside water of refractive index 1.33.

PART C

Answer any three questions, each carries 6 marks.

25 Write down the differential equation of a damped harmonic oscillator and obtain its solution. Show graphically the displacement –time curve for over damped, critically damped and under damped cases of a harmonic oscillator. Mention the conditions of their occurrence.

26 Derive an expression for the diameter of a thin wire in air wedge experiment.

27 Distinguish between Type I and Type II superconductors with suitable diagrams and examples.

28 Write down the Schrodinger equation for a particle in a one-dimensional infinite potential well. Also derive the equation for wave function and energy.

PART C

Answer any three questions. Each question carries 6 marks

29 Explain the production of ultrasonic waves using a piezo electric oscillator with the help of a neat labelled circuit diagram.

30 What are the factors affecting acoustics of buildings? Give remedies.

31 Explain the principle, construction and working of Helium-Neon laser with the help of energy level diagram.

32 What is an LED? Explain the construction and working of LED. Give two applications.

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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

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.

13	Point out any four similarities between electrical and mechanical oscillators	(4)
14	A parallel beam of light (λ = 600nm) falls on a glass plate (μ = 1.5) at an angle of incidence 30^0. 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 45^0 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 $2.5x10^{-5}$ 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 = 8.5×10^{10} N/m^2 and density = 3000kg/m^3.	(4)
22	A cinema hall has a volume of 8000 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 magneto striction 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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Total Pages: 2

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 2 marks Marks

1		What is meant by amplitude resonance? Give any two examples.	(2)
2		Define frequency and wavelength of a wave.	(2)
3		What are non reflecting films?	(2)
4		Compare interference and diffraction of light.	(2)
5		What is Kerr effect? Give the equation.	(2)
6		Write down four important applications of Super conductors.	(2)
7		What is tunnelling effect?	(2)
8		Define phase space.	(2)
9		Define intensity of sound .Give the values of threshold of hearing and threshold of pain.	(2)
10		What is meant by non destructive testing (NDT)? Name an NDT technique?	(2)
11		Define the terms population inversion and meta stable level.	(2)
12		What is an LED? Give its working principle.	(2)

PART B

Answer any 10 questions. Each question carries 4 marks

13		The frequency ofa tuning fork is 250 Hz and its Q-factor is $4x10^4$. Find the relaxation time. Also calculate the time after which its energy becomes **1/10** of its initial undamped value.	(4)
14	a	Obtain the differential equation of the oscillation of an electric circuit.	(2)
	b	Compare it with mechanical oscillator.	(2)
15	a	What is Rayleigh's criterion for spectral resolution?	(2)
	b	Obtain the expression for resolving power of a plane transmission grating.	(2)
16		What is the higher order spectrum which may be obtained with a light of wavelength 5500 Å using a plane transmission grating having 4500 lines per cm.	(4)
17		The refractive indices of Quartz for light of wavelength 5890 Å are 1.5539 for ordinary ray and 1.5634 for extra ordinary ray.Calculate the required thickness of the Quartz crystal for making a) a QWP and b) a HWP.	(4)
18	a	What is Meissner effect?	(2)
	b	What are Type I and Type II Superconductors(any two points)?	(2)
19	a	What are the important postulates of Bose-Einstein Statistics?	(3)
	b	Write down the distribution equation of BE Statistics.	(1)
20		State Uncertainty principle. Using this principle calculate the uncertainty in frequency of the emitted radiation if the uncertainty in time of an excited atom is	(4)

5×10^{-8} s.

21		The volume of a hall is 6000 m^3. It has a total absorption of 150m^2 sabin. If the hall is filledwith audience who add another 80 m^2 sabin, find the difference in reverberation time.	(4)
22		An ultrasonic source of 0.085 MHz sends down a pulse towards the sea water which returnsafter **0.6** sec. The velocity of sound in water is 1800m/s. Calculate the depth of the sea and wavelength of pulse.	(4)
23		With the help of a diagram explain how a hologram is recorded?	(4)
24		Give any four advantages of optical fibre over conventional transmission lines?	(4)

PART C

Answer any three questions. Each question carries 6 marks

25		Considering transverse vibrations of a stretched string derive one dimensional wave equation.	(6)
26	a	Draw the neat diagram of air wedge experiment.	(2)
	b	Derive an expression for the bandwidth of the interference fringes using this arrangement.	(4)
27		Given two Nicol prisms and a Quarter wave plate. How can we produce and analyseplane,circularly and elliptically polarized light.	(6)
28		Starting from the time dependent equation, derive Schrodinger's time independent wave equation.	(6)

PART D

Answer any three questions. Each question carries 6 marks

29		Define Reverberation and Reverberation time. What is the significance of Reverberation time? Compare Reverberation and Echo.	(6)
30	a	What is inverse piezoelectric effect?	(2)
	b	Describe the method of producing ultrasonic waves using this effect.	(4)
31	a	Draw the energy level diagram and explain the working of He–Ne laser.	(5)
	b	What are the important applications of He-Ne Laser?	(1)
32	a	Define numerical aperture and fibre acceptance angle of an optic fibre.	(2)
	b	Derive an expression for numerical aperture (NA) of a step indexfibre.	(4)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, JULY 2018

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks Marks

1	Draw a graph showing the variation of amplitude with frequency of the driver in the case of a forced harmonic oscillator.	(2)
2	Differentiate longitudinal waves from transverse waves.	(2)
3	Explain the reason why the central spot of Newton's rings pattern appears dark in reflected light.	(2)
4	Write any two differences between interference and diffraction phenomenon.	(2)
5	What is Kerr Effect?	(2)
6	What is Meissner effect?	(2)
7	State and explain Heisenberg's uncertainty principle.	(2)
8	What is a phase space?	(2)
9	What is reverberation time? Write down Sabine's formula for reverberation time.	(2)
10	What are the frequency ranges of ultrasonic sound and infrasonic sound?	(2)
11	Write any two differences between a photograph and a hologram.	(2)
12	What is a photodiode?	(2)

PART B

Answer any 10 questions, each carries 4 marks

13	Write down the differential equation for a forced harmonic oscillator and obtain its solution.	(4)
14	A thin inextensible string of length 1 meter is stretched by a weight of 1 *kg*. What should be the new weight so that the fundamental frequency of the string is doubled?	(4)
15	What is Rayleigh's criterion for resolution of grating? Derive expressions for resolving power and dispersive power of a grating.	(4)
16	A soap bubble having a refractive index of 1.33 is suspended in air. When an observer looks at a spot on the soap bubble at an angle of 0^o with the normal, he finds that orange colour of wavelength 600 *nm* is absent in the reflected light. Find the minimum thickness of the soap bubble.	(4)
17	Linearly polarized light changes into circularly polarized light when passed through a thin calcite plate. If the principal refractive indices for the extraordinary and ordinary rays are 1.486 and 1.658 respectively and the wavelength of the light is 589 *nm*, then what is the minimum thickness of the calcite plate?	(4)
18	Describe any four applications of superconductors.	(4)
19	A certain excited state of Helium atom is known to have an average lifetime of	(4)

2.11 x 10^{-8}*s*. What is the minimum uncertainty with which the frequency of the emitted radiation can be measured?

20 Differentiate between Fermi-Dirac and Bose-Einstein statistics. Also write down the distribution function in each case. (4)

21 When a door of height 3 *m* and width 1.5 *m* is kept open, the noise intensity level is found to be 60 *dB*. How much acoustic power enters through the door? (4)

22 What is NDT? Describe with the help of a figure any one method of ultrasonic NDT. (4)

23 What is LASER? Explain the three basic components of a LASER system. (4)

24 Define acceptance angle. Derive an expression for numerical aperture of an optical fibre. (4)

PART C

Answer any three questions, each carries 6 marks

25 Setup the differential equation of motion of a damped harmonic oscillator and obtain its solution. Derive an equation for displacement of particle for underdamped oscillations and draw a plot between time and displacement of the particle. (6)

26 Explain the formation of Newton's rings. Describe how wavelength of a monochromatic source can be determined by forming Newton's rings. (6)

27 With reference to a crystal, explain the terms optic axis and principal section. What is double refraction and explain the difference between positive crystals and negative crystals. (6)

28 A subatomic particle of mass ***m*** is trapped in a one-dimensional infinite square well potential of width ***L***. Using Schrödinger equation obtain the energy eigen values of the particle. (6)

PART D

Answer any three questions, each carries 6 marks

29 Give an account of any three factors affecting the acoustics of a hall. How are they remedied? (6)

30 What is piezoelectric effect? Draw the diagram of a transistor based piezoelectric oscillator and explain its working. Write down an equation for the frequency of the above oscillator. (6)

31 Draw a neat diagram of a He-Ne LASER and explain its construction. Explain its working with the help of energy level diagram of He and Ne. (6)

32 How does light propagate in an optical fibre? Distinguish between step index fibre and graded index fibre. Explain with a block diagram an optical communication system. (6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks. Marks

1	What do you understand by Quality factor? On what factors does it depend?	(2)
2	Write down equation that represents a wave having amplitude 5cm, period 0.002 sec and velocity 1500m/s that moves along **–x** axis.	(2)
3	Why is the centre of Newton's rings pattern dark in reflected system?	(2)
4	What do you mean by resolving power of an optical instrument?	(2)
5	Define Plane of Vibration and Plane of Polarization.	(2)
6	Why a superconductor is called a perfect diamagnet?	(2)
7	What are the characteristics of a well-defined wave function?	(2)
8	Find the smallest volume of a unit cell in phase space for a particle obeying quantum statistics.	(2)
9	What is absorption coefficient?	(2)
10	What is SONAR? Give one use of it.	(2)
11	Distinguish between spontaneous emission and stimulated emission.	(2)
12	What is a photo-detector? Give two examples.	(2)

PART B

Answer any 10 questions, each carries 4 marks.

13	What is the condition for critical damping in the case of a damped harmonic oscillator? With the help of the expression for displacement write how this condition affects the amplitude of the oscillator?	(4)
14	The string of violin **36 cm** long and has a mass of **0.2gm**. With what tension it must be stretched to tune **1000 Hz**.	(4)
15	In a Newton's ring arrangement, if a drop of water (**μ = 4/3**) is placed in between lens and the plate, the diameter of the **10^{th}** dark ring is found to be **0.6 cm**. Obtain the radius of curvature of the face of the lens in contact with the plate. The wavelength of light used is **6000Å**.	(4)
16	Compare grating and prism spectra.	(4)
17	A plane polarised light is incident on a piece of quartz and parallel to the axis. Find the least thickness for which the ordinary and extra-ordinary rays combine to form plane polarized light. Given that the refractive indices for the ordinary and extra-ordinary rays are **1.5442** and **1.5533** respectively and wavelength of	(4)

light is **500nm**.

18	Briefly explain the BCS theory of superconductivity.	(4)
19	Obtain energy and momentum operators.	(4)
20	State the postulates of Bose-Einstein statistics.	(4)
21	The volume of a hall is **3000 m^3**. It has a total absorption of **100 m^2Sabine**. If the hall is filled with audience who add another **80m^2Sabine**, find the difference in reverberation time.	(4)
22	Calculate the thickness of quartz crystal required to produce ultrasonic waves of frequency **1 MHz**. Young's modulus and density of quartz are **8 x 10^{10} N/m^2** and **2650 kg/m^3** respectively.	(4)
23	What is resonant cavity? What is its importance in the production of laser light?	(4)
24	What is an LED? Give its working principle. What are the main uses of it?	(4)

PART C

Answer any three questions, each carries 6 marks.

25	Frame the differential equation of a forced harmonic oscillator and obtain its solution.	(6)
26	Derive cosine law and explain colours in thin films in reflected light	(6)
27	Distinguish between Type I and Type II superconductors citing examples. Explain the formation of Cooper pairs according to BCS theory.	(6)
28	State Uncertainity principle. Explain the absence of electron inside the nucleus using this principle.	(6)

PART D

Answer any three questions, each carries 6 marks.

29	Write any six factors affecting acoustics of buildings and their remedies.	(6)
30	What are ultrasonic waves? What is NDT? Explain how the ultrasonic pulse technique is used for non-destructive testing of materials.	(6)
31	With a neat figure and energy level diagrams, explain the construction and working of a Helium-Neon laser.	(6)
32	With a neat diagram derive an expression for numerical aperture. Give any four applications of optical fibre.	(6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks. Marks

1	What is the effect of damping on the frequency and time period of an oscillator?	(2)
2	Distinguish between transverse and longitudinal waves.	(2)
3	What are coherent sources?	(2)
4	What is grating element? Write the grating equation in terms of grating element.	(2)
5	What is Kerr effect?	(2)
6	Give two examples each for Type-I and Type-II super conductors.	(2)
7	What is tunnel effect?	(2)
8	How the symmetry of wavefunction of a system of particles is related to the statistics obeyed?	(2)
9	What is the difference between echo and reverberation?	(2)
10	What is magnetostriction effect? Write one application.	(2)
11	What are the advantages of semiconductor laser?	(2)
12	What is photovoltaic effect?	(2)

PART B

Answer any 10 questions, each carries 4 marks.

13	Explain the phenomenon of amplitude resonance and obtain the value of resonant frequency.	(4)
14	A wave is represented by $\Psi=3x10^{-3}\cos(8.4 \times 10^{13} t+2.8 \times 10^{5}Z)Vm^{-1}$. Find the amplitude, frequency, wavelength, and wave velocity where z in metre and t in second.	(4)
15	How an interference filter is constructed? Write its working.	(4)
16	In fraunhofer's diffraction due to a single slit a screen is placed **2m** away from the lens to obtain a pattern. If the slit width is **0.2mm** and the first minima lies **5mm** on either side of central maxima, find the wavelength of light.	(4)

17	If a quartz plate act as a half wave plate for plane polarized light of wavelength λ, then show that the same plate would act as quarter wave plate for a wavelength 2 λ.	(4)
18	What is superconductivity? Define transition temperature and critical magneticfield.	(4)
19	Estimate the de Broglie wavelength of an electron moving with a kinetic energy of **100 eV**.	(4)
20	What is Fermi level? Give it's physical significance	(4)
21	A hall has dimensions of 25mX 20mX 8m. The reverberation time is 4 s. Determine the average absorption coefficient of the surfaces.	(4)
22	Calculate the capacitance required to produce ultrasonic waves of frequency **1 MHz** with an inductance of **1 H**.	(4)
23	Compare photographs and holograms.	(4)
24	With a block diagram, explain the working of an optical communication system.	(4)

PART C

Answer any three questions, each carries 6 marks.

25	Solve the differential equation of a damped harmonic oscillator. Explain the time displacement curve of over damped, critically damped and under damped cases.	(6)
26	Explain the formation of interference fringes using air wedge. How is it used to determine the thickness of a thin wire.	(6)
27	Describe an experiment to produce elliptically polarized light beam out of a plane polarized one. How will you detect the same?	(6)
28	Write the Schrodinger equation for a particle trapped in a one dimensional box of width L and solve it to obtain the energy eigen values.	(6)

PART D

Answer any three questions, each carries 6 marks.

29	Define intensity of sound. Write an expression for it. Distinguish between threshold of hearing intensity and pain intensity.	(6)
30	What is inverse piezoelectric effect? With the help of a circuit diagram explain the production of ultrasonic waves using a piezoelectric oscillator.	(6)
31	Explain construction and working of Ruby laser.	(6)
32	Explain the principle of OFC. Distinguish between step index and graded index fibres. Give any two advantages of optical fibres.	(6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks. Marks

1	What is the effect of damping on the frequency and time period of an oscillator?	(2)
2	Distinguish between transverse and longitudinal waves.	(2)
3	What are coherent sources?	(2)
4	What is grating element? Write the grating equation in terms of grating element.	(2)
5	What is Kerr effect?	(2)
6	Give two examples each for Type-I and Type-II super conductors.	(2)
7	What is tunnel effect?	(2)
8	How the symmetry of wavefunction of a system of particles is related to the statistics obeyed?	(2)
9	What is the difference between echo and reverberation?	(2)
10	What is magnetostriction effect? Write one application.	(2)
11	What are the advantages of semiconductor laser?	(2)
12	What is photovoltaic effect?	(2)

PART B

Answer any 10 questions, each carries 4 marks.

13	Explain the phenomenon of amplitude resonance and obtain the value of resonant frequency.	(4)
14	A wave is represented by $\Psi=3x10^{-3}\cos(8.4 \times 10^{13} t+2.8 \times 10^{5}Z)Vm^{-1}$. Find the amplitude, frequency, wavelength, and wave velocity where z in metre and t in second.	(4)
15	How an interference filter is constructed? Write its working.	(4)
16	In fraunhofer's diffraction due to a single slit a screen is placed **2m** away from the lens to obtain a pattern. If the slit width is **0.2mm** and the first minima lies **5mm** on either side of central maxima, find the wavelength of light.	(4)

17	If a quartz plate act as a half wave plate for plane polarized light of wavelength λ, then show that the same plate would act as quarter wave plate for a wavelength 2 λ.	(4)
18	What is superconductivity? Define transition temperature and critical magneticfield.	(4)
19	Estimate the de Broglie wavelength of an electron moving with a kinetic energy of **100 eV**.	(4)
20	What is Fermi level? Give it's physical significance	(4)
21	A hall has dimensions of 25mX 20mX 8m. The reverberation time is 4 s. Determine the average absorption coefficient of the surfaces.	(4)
22	Calculate the capacitance required to produce ultrasonic waves of frequency **1 MHz** with an inductance of **1 H**.	(4)
23	Compare photographs and holograms.	(4)
24	With a block diagram, explain the working of an optical communication system.	(4)

PART C

Answer any three questions, each carries 6 marks.

25	Solve the differential equation of a damped harmonic oscillator. Explain the time displacement curve of over damped, critically damped and under damped cases.	(6)
26	Explain the formation of interference fringes using air wedge. How is it used to determine the thickness of a thin wire.	(6)
27	Describe an experiment to produce elliptically polarized light beam out of a plane polarized one. How will you detect the same?	(6)
28	Write the Schrodinger equation for a particle trapped in a one dimensional box of width L and solve it to obtain the energy eigen values.	(6)

PART D

Answer any three questions, each carries 6 marks.

29	Define intensity of sound. Write an expression for it. Distinguish between threshold of hearing intensity and pain intensity.	(6)
30	What is inverse piezoelectric effect? With the help of a circuit diagram explain the production of ultrasonic waves using a piezoelectric oscillator.	(6)
31	Explain construction and working of Ruby laser.	(6)
32	Explain the principle of OFC. Distinguish between step index and graded index fibres. Give any two advantages of optical fibres.	(6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks. Marks

1	Define sharpness of resonance.	(2)
2	What will happen to fundamental frequency when length of string reduced to one third of original length kept under same tension?	(2)
3	What is meant by optical path?	(2)
4	Distinguish between Fresnel and Fraunhofer diffraction.	(2)
5	Distinguish between positive and negative crystals.	(2)
6	Give any four applications of superconductivity.	(2)
7	What is meant by an eigenvalue equation?	(2)
8	What are microstates and macrostates?	(2)
9	Define intensity of sound wave. Give its equation.	(2)
10	Explain the principle of a piezoelectric oscillator.	(2)
11	What are the characteristic properties of a laser?	(2)
12	Define acceptance angle and numerical aperture of an optical fibre.	(2)

PART B

Answer any 10 questions, each carries 4 marks.

13	What is a damped harmonic oscillator? Draw the graph showing the variation of amplitude with time in case of over damped, critically damped and under damped oscillator.	(4)
14	A wave is represented by **$y= 1.5\sin\pi (0.03x – 7t)$** where amplitude measured in meters and time in seconds. Evaluate Period, frequency, wave length and velocity of the wave.	(4)
15	Write the construction and working of an antireflection coating.	(4)
16	What should be the minimum number of lines in a grating which will just resolve in the second order of lines whose wavelengths are **5890Å and 5896 Å**?	(4)
17	Calculate the minimum thickness of a quartz plate which would convert plane polarized light of wavelength **589 nm** into circularly polarized light. The principal refractive indices of the ordinary and extra ordinary rays are	(4)

1.544 and **1.553** respectively.

18 Explain Type I and Type II Superconductors. (4)

19 With the help of uncertainty principle, explain why electron cannot exist inside the nucleus. (4)

20 Prove that at absolute zero, the probability of occupancy of an energy level below Fermi level is 1. Also show that under the same conditions the probability of occupancy of an energy level above Fermi level is 0. (4)

21 A hall has a volume of is **600 m^3**. It is required to have the reverberation time of **1.5 s**. What should be the total absorption in the hall? (4)

22 A nickel rod of length **10 cm** is used in a magnetostriction oscillator. Calculate the frequency of ultrasonic waves generated, Nickel has Young's modulus of **210 G Pa** and density of **8900 kg/m^3**. (4)

23 Distinguish between spontaneous and stimulated emission of radiation. (4)

24 A fibre cable has an acceptance angle of **30^0** and a core of refractive index **1.4**. Calculate the refractive index of the cladding. (4)

PART C

Answer any three questions, each carries 6 marks.

25 Considering transverse vibrations of a stretched string derive the one dimensional wave equation. (6)

26 Show that the radius for n^{th} dark ring formed in a Newton's rings experiment is proportional to $\sqrt{\lambda}$. (6)

27 Describe the construction of a Nicol prism. Explain its working as a polarizer and as an analyzer. (6)

28 Compare the Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics. (6)

PART D

Answer any three questions, each carries 6 marks.

29 Define reverberation and reverberation time. What is the significance of reverberation time? Compare reverberation and echo. (6)

30 What is magnetostriction effect? With the help of a circuit diagram explain the production of ultrasonic waves using a magnetostriction oscillator. (6)

31 What are the basic components of a laser system? How are these requirements satisfied in the case of Ruby laser? (6)

32 What is Photovoltaic effect? Explain the structure and working of a solar cell. Draw the I-V graph. (6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech examinations (S) September 2020 S1/S2 (2015 Scheme)

Course Code: PH100

Course Name: ENGINEERING PHYSICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks. Marks

1	Explain any two practical cases of damping.	(2)
2	State the laws of transverse vibration of a stretched string.	(2)
3	What are antireflection coatings?	(2)
4	Define dispersive power of a grating and write an expression for it.	(2)
5	What is optic axis and principal section of a doubly refracting crystal?	(2)
6	Define critical temperature and critical field of a superconductor.	(2)
7	Justify the statement "No light source can emit true monochromatic light".	(2)
8	Distinguish between bosons and fermions.	(2)
9	What is echelon effect? How can it be remedied?	(2)
10	How ultrasonic waves are detected using a thermal detector?	(2)
11	What are the basic components of a laser system?	(2)
12	What is the working principle of LED?	(2)

PART B

Answer any 10 questions, each carries 4 marks.

13	The frequency of a tuning fork is **500 Hz** and its Q factor is $\mathbf{7\times10^4}$. Find the relaxation time. Also calculate the time after which its energy becomes $\mathbf{(1/10)^{th}}$ of its initial undamped value.	(4)
14	The equation of transverse vibration of a stretched string is given by **y =0.00327 sin (72.1x-2.72t)**, x and y are in metre and t in seconds. Evaluate (i) Amplitude (ii) Wavelength (iii) Frequency and (iv) Velocity of wave.	(4)
15	Account for the colours of thin films viewed in white light.	(4)
16	Two lines in the second order spectrum of a plane transmission grating are resolved. If the lines are due to lights of wavelengths **5890** $\mathbf{A^0}$ and **5896** $\mathbf{A^0}$. Find the minimum number of lines in the grating.	(4)
17	Explain how anisotropy in crystalline solids contributes to double refraction.	(4)
18	Explain Type I and Type II Superconductors.	(4)
19	An electron is confined in a potential which closely approaches an infinite	(4)

square well of width **2.5x 10^{-10}m**. Calculate the three lowest permissible quantum energies of the electron.

20 Write three postulates of FD statistics and it's distribution equation. (4)

21 Calculate the reverberation time of a hall having volume **4000 m^3** and total sound absorption of **160 Sabine**. Find the additional sound absorption required for an optimum reverberation of **1.5 s**. (4)

22 An ultrasonic source of frequency **0.09 MHz** sends down a pulse towards sea bed which returns after **0.55 s**. The velocity of sound in water is **1800 m/s**. Calculate the depth of the sea and wavelength of the pulse. (4)

23 What is population inversion? Using energy level diagrams explain how it is achieved in a Helium-Neon laser? (4)

24 What are the advantages of optical fibre communication over conventional mode of communication? (4)

PART C

Answer any three questions, each carries 6 marks.

25 Write the differential equation of a forced harmonic oscillator. Derive the expressions for the amplitude and phase difference. (6)

26 Discuss in detail Fraunhofer diffraction at a single slit and obtain the expression for width of central maximum. (6)

27 Define circularly and elliptically polarised light. What is a quarter wave plate? How it can be used to analyze circularly and elliptically polarized light? (6)

28 (a) Assuming the time dependent Schrodinger equation derive time independent Schrodinger equation. (6)

(b) What are eigen values and eigen functions?

PART D

Answer any three questions, each carries 6 marks.

29 Define reverberation and reverberation time. Write Sabine's formula. What is its significance? (6)

30 What is the principle of a piezoelectric oscillator? With the circuit diagram explain the working of a piezoelectric oscillator. (6)

31 Explain the construction and reconstruction of a hologram. Give its advantages over photograph. (6)

32 Define numerical aperture of an optic fibre. Obtain an expression for the numerical aperture of a step index fibre. (6)

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