Registration No/ College Roll No: | | | | | | | | | | |

Total Number of Pages : 03

B. TECH
PH10103

1ST SEMESTER (REGULAR) EXAMINATION– 2019
SUBJECT: ENGINEERING PHYSICS
BRANCH (S): ETC, ME, CSSE, CSSM, CSIT
Time: 3 Hours
Max marks: 100
Answer all Questions from Part – A and Part – B
The figures in the right hand margin indicate marks.

PART – A

Q1. Answer the following questions: [2x15]

a) Find the time taken by a body executing SHM to go directly from its mean position to half of the amplitude in +ve x-direction.

b) What are the forces acted on a damped harmonic system ?

c) 10 numbers of waves of equal amplitude superpose coherently to produce resultant intensity of 10 watt/m^2. What would be their intensity if they superpose incoherently.

d) In a stationary wave the separation between a node and its nearest antinode is 0.25 meter. Find the wavelength of the component wave.

e) The ratio of intensities due to two coherent sources is 9 : 16. Find the ratio of maximum to minimum intensity in interference fringe system.

f) Justify, why Fresnel's zones are treated as half period zones.

g) A glass plate having refractive index 1.66 is to be used as a polarizer. Calculate polarizing angle and angle of refraction.

h) Define plane of vibration and plane of polarisation

i) Write the differences between Fresnel and Franhoffer diffraction.

j) Write Heisenberg's uncertainity principle.

k) Find the eigen value of an operator $\hat{Q} = \frac{d}{dx}$ for its eigen function $\psi(x) = 2e^{4x}$.

l) What are extrinsic and intrinsic semiconductors.

m) Write is the full form for LASER.

n) Explain critical temperature of a superconducting material.

o) Explain top-down and bottom-up method for fabrication of nano material.

PART-B

[7x2]

Q2. (Answer any two)

a) Set up the differential equation for a damped harmonic oscillation. Using the displacement vs time graph, explain different types of damped motion. [4+3]

b) What is a stationary wave? Find the position of node and antinode for a stationary wave. If two SHMs are represented by equations $x_1 = 5\left[\sin 3\pi t + \sqrt{3}\cos 3\pi t\right]$ and $x_2 = 10\left[\sin 3\pi t + \frac{\pi}{4}\right]$. Show that the ratio of their amplitudes is 1 :1. [2+3+2]

c) With a neat lebelled diagram, show how Newton's ring patterns are formed. Obtain an expression for the radius of n^{th} dark dark for reflected light. In Newton's rings experiment the diameter of 5^{th} dark ring is 0.336 cm and diameter of 15^{th} dark ring is 0.630 cm. Find the radius of curvature of the planoconvex lens if wavelength of light used is 5400 A°. [2+3+2]

Q.3. (Answer any two) **[7x2]**

a) What is a zone plate ? Deduce the expression for focal lengths of a zone plate using its imaging action. Write two dissimilarities between a zone plate and a convex lens. [1+4+2]

b) Explain double refraction of unpolarised light through a calcite crystal. With neat lebelled diagram, explain the working of a Nicol Prism act as a polarizer. [2+5]

c) Discuss the expression of intensity of Franhoffer diffraction due to single slit. Obtain the condition for principal maxmum. [5+2]

Q.4. (Answer any two) **[7x2]**

a) Write the physical significances of a wave function in quantum mechanics. Obtain the time independent schrodinger's equation for a free particle. A ball of mass 10 gm has speed 50 m/ sec. Calculate the de-Broglie wavelength associated with it. [1+4+2]

b) Explain, Einstein's theory of photoelectric effect. Find out the energy eigen values of a particle in one dimensional potential box of infinite height. [2+5]

c) What is black body radiation? Mention the properties of balack body radiation. State Wein's displacement law. [2+4+1]

Q.5. (Answer the followings) **[7x2]**

a) Distinguish insulator, conductor and semiconductor with respect to their energy band diagrams. Draw the energy band diagram for p-type and n-type semiconductors. [3+4]

b) Explain the principle of lasing action in LASER. Write important properties of LASER light. Give two applications of LASER. [5+2]

Q.6. (Answer the followings) **[7x2]**

a) Explain BSC theory of superconductivity. How critical magnetic field of superconductor is related to temperature ? [5+2]

b) Classify nano materials with respect to their dimensions. Write the applications of carbon nano tube (CNT). [4+3]

Course Outcome Assessment Scheme:

CO1: Understand oscillatory systems including simple, damped and forced harmonic motion.

Q1(a) + Q1(b) + Q1(c) + Q1(d) + Q1(e) + Q2 {(a), (b), (c)} = 24 marks

CO2: Understand the wave characteristics and the phenomenon of interference, diffraction and polarization of light.

Q1(f) + Q1(g) + Q1(h) + Q1(i) + Q3 {(a), (b), (c)} = 22 marks

CO3: Understand the concept of quantum mechanics and its application to one dimensional problems.

Q1(j) + Q1(k) + Q4 {(a), (b), (c)} = 18 marks

CO4: Understand the functioning of semiconductor pn junction and lasers in terms of band theory.

Q1(l) + Q1(m) + Q5(a) + Q5(b) = 18 marks

CO5: Understand BCS theory of superconductivity and properties of superconductors.

Q1(n) + Q6 (a) = 9 marks

CO6: Know the concept of Nanoscience and Nanotechnology.

Q1 (o) + Q6(b) = 9 marks

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