Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

15BS1102

1st Semester Back Examination 2018-19

PHYSICS

BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE

Time : 3 Hours

Max Marks : 100

Q.CODE : E846

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 **Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Define Simple Harmonic motion and mention its characteristics.

b) The amplitudes of two coherent waves are in the ratio 2:3. Find the ratio of maximum to minimum intensities when they superpose.

c) Mention the conditions necessary for production and observation of an interference pattern.

d) Distinguish between the Fresnel and Fraunhofer class of diffraction.

e) The indices of refraction for ordinary and extra-ordinary light for mica are 1.586 and 1.592 respectively. Find the thickness of quarter wave plate of mica for light of wavelength 5890 Å.

f) Write down Stoke's theorem.

g) State Faraday's electromagnetic induction and express it mathematically.

h) What is Compton effect?

i) Calculate the de Broglie wavelength of a particle of mass 0.02 kg moving with a speed of 400 m/s.

j) What is the physical meaning of wave functionΨ?

Part- II

Q2 Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) **(6 x 8)**

a) What do you mean by normal mode of oscillation? Compare between Q_1 and Q_2 mode oscillations.

b) State principle of superposition. Two waves of same frequency and having amplitudes A_1 and A_2 superpose coherently producing interference pattern. Derive the expression for maximum and minimum intensity of resultant wave.

c) Discuss the interference in biprism. Derive the expression for fringe width.

d) Discuss Fraunhofer diffraction in a single slit. Show that intensity of secondary maxima decreases with increase in order.

e) What is zone plate? Differentiate zone plate from convexlens.

f) What is Brewster's law? Using this show that the reflected and transmitted rays in a glass slab are perpendicular to each other.

g) What do you mean by double refraction? With neat diagram describe the construction and working of a Nicol prism?

h) What do you mean by divergence and curl of a vector field? Find the value of divergence of curl of a vector field.

i) What is displacement current? Using modified Ampere's circuital law derive the Maxwell's 4^{th} equation in differential form.

j) Using Maxwell's equations, mathematically show the transverse nature of electromagnetic wave.

k) State de Broglie hypothesis matter wave. Derive time independent Schrodinger equation.

l) What is Heisenberg Uncertainty principle? Illustrate the principle in gamma-ray microscope.

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Starting from differential equation discuss the resonance and quality factor of forced oscillator. **(16)**

b) (i) Deduce the expression for diameter of dark ring in Newton's ring experiment and explain how the wavelength of monochromatic light can be measured by it.

(ii) Newton's rings are formed using a lens of radius of curvature 100 cm. Calculate the diameter of 20^{th} dark ring with wavelength 5900Å.

Q4 **a)** (i) What is a diffraction grating? Deduce the condition for principal maximum, secondary maxima and minima of a grating. **(16)**

(ii) Find out the grating element of a plane diffraction grating of width 3.5 cm and 15000 rulings.

b) (i) How is elliptically polarized light produced? How it light can be converted to plane polarized?

(ii) 40 gm of cane-sugar is dissolved in water to make 100 cc solution and the solution is filled in a glass tube of length 20 cm. This liquid path causes 53.5 ^{0}C optical rotation. Compute the value of specific rotation.

Q5 **a)** (i) What is Poynting vector? Deduce Poynting theorem. **(16)**

(ii) State Gauss' law of electrostatics.

b) (i) Derive the wave equation in free space for electric vector E and for magnetic field vector B.

(ii) State Green's theorem.

Q6 **a)** Outline the basic facts of photo-electricity. Give laws of photo-electric emission. How can they be explained? **(16)**

b) Using Schrodinger's equation find out the wave function and energy eigen values of a free particle in a infinite potential well of width 'a'.