

Total No. of Printed Pages:2

**SUBJECT CODE NO:- B-2147**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y (Sem.-II) Examination OCT/NOV 2019**  
**Physics Paper- IV**  
**Geometrical & Physical Optics**

[Time : 1:30 Hours]

[Total Marks : 50]

Please check whether you have got the right question paper.

N.B. :

- i. Attempt all question.
- ii. Use of logarithmic table and electronic pocket calculator is allowed.

- Q.1
- |  |   |    |
|--|---|----|
|  | a) Give construction and working of Huygen's eyepiece.              | 10 |
|  | b) Describe construction and working of Michelson's Interferometer. | 10 |

**OR**

- |  |  |    |
|--|--|----|
|  | c) Explain in details Fraunhofer's diffraction due to a double slit.     | 10 |
|  | d) What is Nicol Prism? Explain construction and working of Nicol Prism. | 10 |
- Q.2
- |  |   |    |
|--|---|----|
|  | a) Write a short note on cardinal points.   | 05 |
|  | b) Find the equivalent focal length, If the focal length of Hyugen's eyepiece are 4cm and 12cm respectively.  | 05 |
|  | c) Write a short note on Rayleigh's criterion.  | 05 |
|  | d) Calculate the number of lines per meter on the surface of grating? If light of wavelength 500nm is incident on a plane transmission grating a second order spectral line is observed at an angle of $30^\circ$ . | 05 |

**OR**

- |  |  |    |
|--|--|----|
|  | a) Draw a neat diagram and explain the fringes produced by a wedge shaped thin film.   | 05 |
|  | b) Newton's rings are formed with light of wavelength 600nm. The radius of the 20 <sup>th</sup> ring is found to be $1.1 \times 10^{-2}$ . Find the radius of curvature of the lens. | 05 |
|  | c) Write a note on optical activity.   | 05 |
|  | d) Determine the specific rotation of the sugar solution, if the plane of polarization is turned through $13.2^\circ$ and the length of tube containing 10% solution is 20cm.        | 05 |

- Q.3 Multiple choice question. 10

- 1) The points having unit lateral magnification in a lens system are called.
 

a) Principal foci	b) Nodal point	c) Principal point	d) Cardinal point
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- 2) In Huygen's eye piece, the separation between the two planoconvex lenses is given by.
 

a) $\frac{3f}{2}$	b) $\frac{2f}{3}$	c) 2f	d) f
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- 3) In Newton's ring experiment, rings are formed when light is \_\_\_\_\_ by lower surface of the lens and upper surface of the glass plate interfere.  
 a) Reflected                      b) Refracted                      c) Both a & b                      d) None of above
- 4) If  $\theta$  is the angle of wedge, then fringe width due to interference in wedge shaped air film is.  
 a)  $\lambda/\theta$                       b)  $\lambda/2\theta$                       c)  $\theta/\lambda$                       d)  $2\theta/\lambda$
- 5) The power of an optical instrument by which it can form separate images of two close object is called.  
 a) Dispersive power                      b) Magnifying power  
 c) Resolving power                      d) Diopter
- 6) In a plane transmission grating the angle of diffraction for the second order principal maxima for the wavelength  $5 \times 10^{-5}$  cm is  $30^\circ$ . The number of lines in one centimeter of grating surface will be.  
 a) 100                      b) 10                      c) 1000                      d) 5000
- 7) Polaroid sunglasses decrease glare on a sunny day because they.  
 a) Block a portion of light                      b) have a special colour  
 c) completely absorbs                      d) refract the light
- 8) The substance which produces the rotation of the plane of polarization towards right looking towards the source is called.  
 a) Dextrorotatory                      b) Levorotatory                      c) Polaroid                      d) None of above
- 9) If there are  $5 \times 10^4$  number of lines per meter on the grating surface, the R.P. of grating for the first order spectrum is.  
 a)  $2 \times 10^{-5}$  m                      b)  $2 \times 10^5$  m                      c)  $5 \times 10^5$  m                      d)  $5 \times 10^4$  m
- 10) The bending of a beam of light around the corners of an obstacle is called.  
 a) Interference                      b) Diffraction                      c) Dispersion                      d) Polarization

Total No. of Printed Pages:2

**SUBJECT CODE NO:- B-2148**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y (Sem.-II) Examination OCT/NOV 2019**  
**Physics Paper-V**  
**Electricity & Magnetism**

[Time: Three Hours]

[Max.Marks:50]

- N.B Please check whether you have got the right question paper.
- i) Attempt all question.
  - ii) Use of logarithmic table and electronic pocket calculator is allowed.

- Q.1 a) Define and explain (i) Line integral 10  
 (ii) Surface integral (iii) Volume integral  
 b) State and prove Gauss law in electrostatics. 10

**OR**

- c) Derive an expression for magnetic induction due to straight conductor carrying current. 10  
 d) Obtain an expression for growth of charge on a capacitor through resistor. 10

- Q.2 a) What is scalar triple product? Prove that scalar triple product of vectors is volume of Paralleliped. 05  
 b) Find  $(\vec{A}, \vec{B}, \vec{C})$ , If  $\vec{A} = 2\vec{i} - \vec{j} + \vec{k}$ ,  $\vec{B} = 4\vec{j} + \vec{k}$ ,  $\vec{C} = 6\vec{i}$  05  
 c) Obtain Ampere's law in differential form  $\text{curl } \vec{B} = \nabla \times \vec{B} = \mu_0 \vec{J}$  05  
 d) A solenoid has a radius 0.2 m and length 2 meters. It has 4 layers of 1000 turns each. Calculate the magnetic flux density at its centre when a current of 3A flows through it. 05

**OR**

- a) Write a short note on dielectrics 05  
 b) Calculate the distance at which point charge of  $2 \times 10^{-11}$  coulomb will produce field strength of 0.5 N/C. 05  
 c) Write a short note on LC circuit. 05  
 d) A capacitor charged by a D. C. Source through a resistance of 2 mega ohm takes 0.5 seconds to charge  $\frac{3}{4}$  of its final value show that capacitance of the capacitor is nearly 0.18 microfarad 05

- Q.3 Multiple choice question. 10

1. Which of the following is true.

- a)  $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{C}(\vec{A} \cdot \vec{B})$
- b)  $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{C}(\vec{A} \cdot \vec{B}) - \vec{B}(\vec{A} \cdot \vec{C})$
- c)  $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{A}(\vec{B} \cdot \vec{C})$
- d) None of above

2. Which of the following theorems convert line integral to surface integral?

- a) Gauss divergence theorem
- b) Stoke's theorem
- c) Green's theorem
- d) Stoke's and Green's theorem

3. The coulomb's law can be formulated from the

- a) Gauss law                      b) Ampere law  
c) Biot-Savart law                d) Lenz law

4. Mathematically the electric displacement is represented by

- a)  $\vec{D} = \frac{1}{4\pi} \frac{q}{r^2} \hat{r}$                       b)  $\vec{D} = \epsilon \vec{E}$   
c)  $\vec{D} = \frac{q}{a}$                                       d) all of the above

5. The magnetic induction due to a long conductor carrying a current of 1A at a distance of 2m from the conductor is

- a)  $10^{-7} \text{ Wb/m}^2$                       b)  $2 \times 10^{-7} \text{ Wb/m}^2$   
c)  $\frac{1}{2} 10^{-7} \text{ Wb/m}^2$                       d)  $4 \times 10^{-7} \text{ Wb/m}^2$

6. The magnetic flux density at a distance of 0.01 m from a very long and straight wire carrying current of 10A is

- a)  $6 \times 10^{-4} \text{ Tesla}$                       b)  $2 \times 10^{-4} \text{ Tesla}$   
c)  $6 \times 10^{-3} \text{ Tesla}$                       d)  $10^{-3} \text{ Tesla}$

7. In LCR circuit for damped condition

- a)  $\frac{R}{4L} = \frac{1}{LC}$                       b)  $\frac{R^2}{4L^2} = \frac{1}{LC}$   
c)  $\frac{R}{4L^2} = \frac{1}{C}$                               d)  $\frac{R}{4L^2} = \frac{1}{C}$

8. The volume of parallelepiped whose sides are given by  $\vec{A} = 2\vec{i} - 3\vec{j}$ ,  $\vec{B} = \vec{i} - \vec{j} + \vec{k}$  &  $\vec{C} = 3\vec{i} - \vec{k}$

- a)  $\frac{4}{13}$                                       b) 4  
c)  $\frac{2}{7}$                                       d) None of the above

9. For decay of current in LR circuit time constant is the time required to fall the current from maximum value to

- a)  $\frac{1}{e}$  times maximum current  
b) e times maximum current  
c) 2e times maximum current  
d)  $e^2$  times maximum current

10. In LR Circuit having inductance 4H and  $R = 1\Omega$  and applied D.C. emf of 6V is switched then maximum current is

- a) 6A                                      b) 2A  
c) 3A                                      d) 5A

Total No. of Printed Pages:2

**SUBJECT CODE NO:- B-2155**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. S.Y (Sem-IV) Examination OCT/NOV 2019**  
**Physics Paper-XI**  
**(General Electronics)**

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- N.B i) Attempt all questions  
 ii) Use of algorithmic table and calculator is allowed.

- Q.1 a) Explain the construction and working of a FET. 10  
 b) Draw the circuit diagram of transistor Astable multivibrator and explain its operation and waveforms. 10

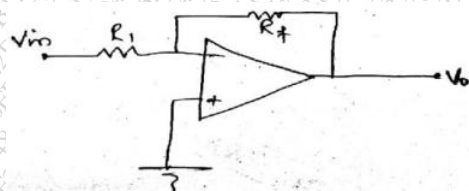
OR

- a) Draw the circuit diagram of a single stage transistor amplifier and explain frequency response of it. 10  
 b) For an amplitude modulated wave, obtain the equation for total power. 10

- Q.2 a) Distinguish between zener diode and ordinary diode 05  
 b) What is a feedback? Explain its different types in short. 05  
 c) Calculate the frequency of Hartley oscillator having inductor of 1 mh and capacitor  $0.1\mu\text{F}$  05  
 d) The total power content of an AM wave is 2.64 KW at a modulation percentage of 80% Determine the power content of the current wave. 05

OR

- a) A transistor has  $\alpha = 0.98$ ,  $I_B = 100\mu\text{A}$  and  $I_{co} = 6\mu\text{A}$ . Calculate  $I_C$  and  $I_E$ .  
 b) Calculate the o/p voltage for the circuit



$$V_i = 5\text{V}$$

$$V_o = ?$$

$$R_1 = 10\text{K}\Omega$$

$$R_f = 100\text{K}\Omega$$

c) Explain the transistor h-parameters

d) What are the advantages of frequency modulation over amplitude modulation

## Q.3 Multiple Choice Questions

1. 1 eV is equal to -----.

- a)  $6.02 \times 10^{23} \text{ J}$       b)  $1.6 \times 10^{-19} \text{ J}$   
 c)  $6.25 \times 10^{18} \text{ J}$       d)  $1.66 \times 10^{-24} \text{ J}$

2. A transistor is a ..... operated device.  
(a) Voltage (b) Current  
(c) Both voltage and current (d) None of these
3. The process of modulation is carried out at -----.  
a) Transmitter b) receiver c) oscillator d) amplifier.
4. In AM, power content is maximum when m equals  
a) 0 b) 1 c) 0.8 d) 0.5
5. In phase modulation, phase deviation depends upon  
a) modulating frequency b) amplitude of the modulating signal  
c) the carrier frequency d) amplitude of the carrier signal.
6. An ideal operational amplifier has  
a) infinite input impedance b) Zero i/p impedance  
c) infinite output impedance d) none of above
7. The gain of the amplifier with feedback is known as ----- gain.  
a) open loop b) closed loop c) resonant d) none of these
8. The intersection of load line with the output characteristics is called as -----.  
a) Saturation point b) depletion point  
c) operating point d) transfer point
9. Multivibrators belong to the category of -----  
a) Square wave oscillators b) triangular wave oscillators  
c) ramp wave oscillators d) sinusoidal oscillators
10. The  $h_{fe}$  parameter is called ----- in CE configuration with output shorted.  
a) Voltage gain b) current gain  
c) input impedance d) none of the above.

Total No. of Printed Pages:02

B-2151

**SUBJECT CODE NO:- B-2151**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. T.Y (Sem-VI) Examination OCT/NOV 2019**  
**Physics Paper-XIX**  
**(Atomic Molecular Physics & Laser)**

[Time: 1:30 Hours]

[Max.Marks:50]

N.B Please check whether you have got the right question paper.

- i) Solve all questions.  
 ii) Draw the neat diagram whenever necessary

Q.1 (a) Explain origin of spectral lines and hence discuss the series of spectrum of hydrogen atom using Bohr's theory. 10

(b) Explain normal Zeeman effect and Stark effect. Discuss importance of these effects. 10

**OR**

(a) Explain Raman effect and Raman shift. Write down applications of Raman effect. 10

(b) Give the principle construction and Working of Ruby Laser. Write down its applications. 10

Q.2 A (i) Write short notes on Bohr atom model. 05

(ii) Calculate the velocity of electron in first Bohr orbit of radius  $0.53\text{\AA}$ . (Mass of electron  $= 9.1 \times 10^{-31} \text{ kg}$  Planck's constant  $= 6.63 \times 10^{-34} \text{ J-s}$ . 05

B (i) Write short notes on Rayleigh Law of Scattering. 05

(ii) Find the bond length of a molecule of moment of inertia  $4.5 \times 10^{-45} \text{ Kg m}^2$  and reduced Mass  $1.62 \times 10^{-27} \text{ Kg}$ . 05

**OR**

Q.2A (i) Write a short note on vector atom model. 05

(ii) Find the change in wavelength between modified lines and unmodified lines of wavelength  $4000\text{\AA}$  when magnetic induction of 2.5 T is applied in normal Zeeman effect. 05

B (i) Write a short note on population inversion 05

(ii) Calculate the change in electron energy transferred to atom in order to stimulate the emission of light of wave length  $3000\text{\AA}$ . (Planck's constant  $6.63 \times 10^{-34} \text{ J-s}$  velocity of light  $3 \times 10^8 \text{ m/s}$ ) 05



Q.3 Choose the Correct answer

1. The frequency of one photon of wavelength 5000 Å is

- (a)  $6 \times 10^{15} \text{ Hz}$  (b)  $6 \times 10^{14} \text{ Hz}$  (c)  $0.6 \times 10^{12} \text{ Hz}$  (d)  $3 \times 10^{14} \text{ Hz}$ .

2. Which of the following is example of optical pumping

- (a) He – Ne laser (b) Ruby laser  
(c) Semiconductor laser (d) Dye laser.

3. The ratio of energy of rotational level for  $J=1$  to  $J=2$  is

- (a) 2:1 (b) 1:2 (c) 1:3 (d) 4:1

4. The energy of diatomic molecules in ground state is

- (a) zero (b) Infinite (c) positive (d) Negative

5. According to Rayleigh scattering law Intensity of scattered Light is proportional to

- (a)  $\lambda$  (b)  $\frac{1}{\lambda}$  (c)  $\lambda^4$  (d)  $\frac{1}{\lambda^4}$

6. In L - S coupling for three electrons system S values are

- (a) 1 and 1 (b) 2 and 1 (c)  $\frac{3}{2}$  and  $\frac{1}{2}$  (d) 3 and 1

7. Magnetic Quantum number for spin can have values.

- (a) 1 (b)  $+\frac{1}{2}$  (c)  $-\frac{1}{2}$  (d)  $+\frac{1}{2}$  and  $-\frac{1}{2}$

8. Velocity of electron in Bohr orbit is proportional to

- (a)  $n$  (b)  $n^2$  (c)  $\frac{1}{n^2}$  (d)  $\frac{1}{n}$

9. Shortest Wave length for Balmer Series of Hydrogen Spectra.

- (a)  $R$  (b)  $\frac{1}{R}$  (c)  $\frac{R}{4}$  (d)  $\frac{4}{R}$

10. Plum- pudding atom model is suggested by

- (a) Rutherford (b) Thomson  
(c) de-Broglie (d) Dalton.





Total No. of Printed Pages:2

**SUBJECT CODE NO:- B-2007**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y. (Sem-I) Examination Oct/Nov 2019**  
**Physics Paper-I**  
**Mechanics Properties of Matter and Sound**

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- i) Attempt all questions.
- ii) Use of logarithm table and electronic pocket calculator is allowed.

- Q.1 (a) What is compound pendulum? Obtain an expression for the time period of oscillation of compound pendulum. 10
- (b) Derive an expression for the depression of loaded end of a cantilever if weight of beam is ineffective. 10

OR

- (c) Describe with necessary theory of jaeger's method for the measurement of surface tension of liquid. 10
- (d) Derive Sabine's formula for reverberation time. 10

- Q.2 (a) Explain gravitational potential and gravitational field. 05
- (b) Calculate gravitational potential and Intensity of gravitational field of a thin spherical shell of mass 12 kg and radius 30cm at a point 20 cm outside from the surface. 05
- (G =  $6.6 \times 10^{-11} \text{Nm}^2/\text{Kg}^2$ ).

- (c) Write a note on surface tension. 05
- (d) A small hollow sphere which has a small hole in it is immersed in water to depth of 40 cm before any water penetrates into it. If the surface tension of water is 73 dynes/cm. Find the radius of the hole. 05

OR

- (a) Write a short note on elastic constant. 05
- (b) What couple must be applied to a wire one meter long 1mm in diameter in order to twist one end of it through  $90^\circ$ , the other end remaining fixed? The rigidity of the material of the wire is  $2.8 \times 10^{11} \text{ dynes / cm}^2$ . 05

- (c) Write a applications of ultrasonic waves. 05
- (d) A hall of volume  $5500\text{m}^3$  is found to have a reverberation time of 2.3 sec. The sound absorbing surface of the hall has an area  $750 \text{ m}^2$ . Calculate the average absorption coefficient. 05

## Q.3 Multiple choice questions.

- 1) For good acoustical design of hall reverberation should be  
 (a) Infinite (b) zero (c) Proper (d) maximum
- 2) Kinetic energy per unit volume of the liquid is  
 (a)  $\frac{1}{2}\rho V^2$  (b)  $PV^2$  (c)  $\frac{1}{2}V^2C$  (d)  $\frac{1}{2}\rho V$
- 3) Excess pressure in soap bubble is -----  
 (a)  $\frac{T}{R}$  (b)  $\frac{4T}{R}$  (c)  $\frac{4R}{T}$  (d)  $\frac{2T}{R}$
- 4) Ultra Sonography is an application of -----  
 (a) X-ray  
 (b) Digital photography  
 (c) Reverberation  
 (d) Supersonic waves
- 5) The gravitational potential at a point on the surface of the earth is  
 (a) g (b) gR (c)  $\frac{gR}{2}$  (d) zero
- 6) The unit of gravitational potential is -----  
 (a) J (b)  $\frac{J}{kg}$  (c) J.Kg (d) Kg
- 7) The modulus of elasticity is dimensionally equivalent to-----  
 (a) Strain (b) Stress (c) Surface tension (d) Poission's ratio
- 8) The Bulk modulus of gas is  $6 \times 10^3 N/m^2$  the additional pressure needed to reduce the volume of the gas by 10% is -----  
 (a)  $300 N/m^2$  (b)  $600 N/m^2$   
 (c)  $1000 N/m^2$  (d)  $400 N/m^2$
- 9) The symbol y, k and  $\eta$  represents the young's modulus; Bulk modulus and modulus of rigidity of material of body if  $\eta = 3K$  then y =  
 (a)  $Y=2.5K$  (b)  $Y=9.5K$  (c)  $Y=4.5K$  (d)  $Y=3.5K$
- 10) Piezo electric effect is observed in -----  
 (a) Diamond (b) Nickel  
 (c) Gold (d) Quartz crystal

Total No. of Printed Pages:2

**SUBJECT CODE NO:- B-2008**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y. (Sem-I) Examination Oct/Nov 2019**  
**Physics Paper-II**  
**Heat and Thermodynamics**

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- i) Attempt all questions.
- ii) Illustrate your answer with suitable labelled diagram.

Q.1 (a) Define coefficient of thermal conductivity deduce expression for radial flow of heat along the wall of cylindrical tube. 10

(b) What is critical constant. Derive an expression for constant of vanderwall's equation. 10

OR

(c) What is adiabatic process. Derive an expression for work done in adiabatic process. 10

(d) Discuss change of entropy in an irreversible process and show that  $\frac{Q_2}{T_2} - \frac{Q_1}{T_1} > 0$  10

Q.2 (a) Write a note on comparison of conductivities of different metals. 05

(b) The opposite faces of a metal plate of 0.2 cm thickness are at a difference of temperature of 100°C and the area of the plate is 200 sq. cm. Find the quantity of heat that will flow through the plate in one minute if K=0.2 CGS unit. 05

(c) Write a note on Carnot's ideal heat engine. 05

(d) Find the efficiency of a Carnot's engine working between 127 °C and 27 °C. 05

OR

(a) Explain correction for volume in vanderwall's gas equation. 05

(b) The Vanderwall's constant a and b for 1 gram molecule of hydrogen are a=0.245atms-liter<sup>2</sup>-mole<sup>2</sup> and b=2.67 × 10<sup>-2</sup> liter-mole<sup>-1</sup>. Calculate the critical temperature. 05

(c) Using maxwell's thermodynamical relation prove that 05

$$\frac{dP}{dT} = \frac{L}{T(V_2 - V_1)}$$

(d) Calculate the change in entropy when 100gm of Ice at 0°C is converted into water at the same temperature. 05

(Given Latent heat of Ice = 80 Cal/gm)

## Q.3 Multiple choice questions.

10

- 1) The rate of change of temperature with respect to distance is -----
  - (a) Velocity of gradient
  - (b) Mass concentration gradient
  - (c) Temperature gradient
  - (d) None of these
- 2) Heat transmitted through a substance with actual migration of particles.
  - (a) Convection
  - (b) Conduction
  - (c) Radiation
  - (d) All of these
- 3) A Carnot's engine is operating between  $100^{\circ}\text{C}$  and  $50^{\circ}\text{C}$ . Its efficiency will be -----
  - (a) 13.4%
  - (b) 15.2%
  - (c) 50%
  - (d) 100%
- 4) An isothermal process is related to -----
  - (a) Constant pressure
  - (b) Constant volume
  - (c) Constant temperature
  - (d) Constant heat
- 5) Volume of sphere of influence of the molecule is----- time of the volume of molecule.
  - (a) 8
  - (b) 6
  - (c) 4
  - (d) 10
- 6) The critical constant of temperature ( $T_c$ ) is -----
  - (a)  $\frac{a}{27Rb}$
  - (b)  $\frac{8ab}{27R}$
  - (c)  $\frac{27Rb}{8a}$
  - (d)  $\frac{8a}{27Rb}$
- 7) maxwell's thermodynamical relation does not depend on
  - (a) Temperature
  - (b) Pressure
  - (c) Volume
  - (d) Density
- 8) The clausius – claapeyron equation is -----
  - (a)  $\frac{dP}{dt} = \frac{L}{T(V_2 - V_1)}$
  - (b)  $\frac{dP}{dt} = \frac{P}{T(V_2 - V_1)}$
  - (c)  $\frac{dP}{dt} = T_L(V_2 - V_1)$
  - (d) None of these
- 9) Maxwell's thermodynamic relation is
  - (a)  $\left(\frac{ds}{dT}\right)_T = \left(\frac{\partial P}{\partial V}\right)_T$
  - (b)  $\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V$
  - (c)  $\left(\frac{\partial T}{\partial P}\right)_P = \left(\frac{\partial V}{\partial P}\right)_P$
  - (d) None of these
- 10) Entropy is measured in -----
  - (a) Joules / Kelvin
  - (b) Cal / Kelvin
  - (c) Both (a) and (b)
  - (d) None of the above

Total No. of Printed Pages:2

**SUBJECT CODE NO:- B-2015**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. S.Y. (Sem-III) Examination Oct/Nov 2019**  
**Physics -VII**  
**Mathematical Statistical Physics and Relativity**

[Time: 1:30 Hours]

[Max.Marks:50]

N.B Please check whether you have got the right question paper.  
 1) Attempt all questions  
 2) Use of logarithmic table and electronic pocket calculator is allowed

- Q.1 a) Obtain the solution of Homogenous second order linear differential equations with constant coefficients. 10  
 b) Write the conditions of fermions Derive Fermi- Dirac distribution law. 10  
 OR  
 a) Define probability and frequency Explain the basic additive law of probability. 10  
 b) Explain construction and working of Michelson's interferometer 10
- Q.2 a) Distinguish between F.D and B.E statistics. 05  
 b) Discuss the exact differentiation of function. 05  
 c) Ten particles are distributed in 2 cells find the possible number of macrostates and corresponding number of microstates. 05  
 d) If 4 kg of mass is converted fully into energy. find the amount of energy generated. 05  
 OR  
 a) If  $y = A \sin wt + B \cos wt$  show that  $\frac{d^2y}{dt^2} = -w^2y$  05  
 b) Find the number of ways in which four bosons may be the distributed in the five cells. 05  
 c) What is thermodynamic probability 05  
 d) Obtain Einstein's energy mass relation. 05
- Q.3 Attempt all 10  
 1) The degree of the given differential equation is  $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + xy = 0$   
 a) 1 b) 3 c) 2 d) 4  
 2) The quantity  $dF = Fx dx + Fy dy + f_2 d_2$  is known as  
 a) Implicit function b) An exact differential of F  
 c) Total differential of F d) Explicit functional of F  
 3) All fundamental particles with spin ----- are fermions.  
 a) 2 b) -1 c)  $\frac{1}{2}$  d)  $-\frac{1}{2}$

- 4) How many ways two particles can be arranged in three cells according to M.B statistics  
a) 9                      b) 6                      c) 4                      d) 27
- 5) RMS velocity of an ideal gas is inversely proportional to the square root of  
a) Mass                      b) temperature                      c) None of these                      d) both of a and b
- 6) The value of probability of an event cannot be  
a) Zero                      b) negative                      c)  $\frac{1}{2}$                       d) 1
- 7) The M.B distribution law in general can be expressed as ,  
a)  $ni = gi e^{-\alpha} e^{-Ei\beta}$                       b)  $ni = \frac{gi}{e^{-\alpha} e^{-\beta Ei}}$                       c)  $ni = \frac{gie^{-\alpha}}{e^{-\beta Ei}}$                       d)  $ni = \frac{gie^{-\beta Ei}}{e^{-\alpha}}$
- 8) The negative results of Michelson Morley experiment concluded that the velocity of light is  
a) Variant                      b) can't say                      c) constant                      d) none of these
- 9) The length determined by an observer at rest with respect to the object is called  
a) Proper length                      b) rest length                      c) length contraction                      d) length elongation
- 10) Particle with a proper lifetime is  $1\mu s$  moves through the laboratory at  $2.7 \times 10^8 m/s$  .  
the lifetime of particle as measured by observer in laboratory is -----  
a)  $2.3 \times 10^6 sec$                       b)  $4.6 \times 10^6 sec$                       c)  $2.3 \times 10^{-6} sec$                       d)  $4.6 \times 10^{-6} sec$



Total No. of Printed Pages:2

**SUBJECT CODE NO:- B-2016**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. S.Y. (Sem-III) Examination Oct/Nov 2019**  
**Physics -VIII**  
**Modern and Nuclear Physics**

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- i) Attempt all questions.
- ii) Use of logarithmic table and electronic pocket calculator is allowed.

- Q.1
- a) Draw a schematic arrangement of Richardson and Compton experiment and obtain a relation between velocity of photo electrons and frequency of light. 10
  - b) What are the various nuclear models? Give briefly the liquid drop model of nucleus. 10
- OR
- a) Explain in details Laue experiment. 10
  - b) Explain in detail the working principle of cyclotron. 10
- Q.2
- a) Write the general characteristics and features of photo conductive cell 05
  - b) Write a note on characteristics of X-rays. 05
  - c) Calculate the binding energy of an  $\alpha$  particle from given data 05  
 mass of helium nucleus = 4.001265 amu  
 mass of proton = 1.007277 amu  
 mass of neutron = 1.008666 amu
  - d) A 15 mcV alpha particles losses all its energy in propotional counter one ion pair is produced for each 30 ev of energy loss. The proportional counter has a multiplication A=600 and the total capacitance between wire and ground is 25 pf. Calculate the voltage pulse height. 05
- OR
- a) What will be the maximum velocity of a photo-electrons if anode. Potential is 2 KV. 05
  - b) The glancing angle for the first order spectrum is  $7^\circ$  find the wavelength of X-rays if  $d = 2.85 \times 10^{-10} \text{m}$ . 05
  - c) Give the importance of Deuteron binding energy. 05
  - d) Write a note on ionization chamber. 05
- Q.3 Attempt all 10
- 1) Photo-electric cells are used to convert
    - a) Electrical energy into light energy
    - b) Light energy into electrical energy
    - c) Light energy into magnetic field
    - d) None of these
  - 2) The photo-electric effects involves only for
    - a) Free electrons
    - b) Bound electrons
    - c) Both free and bound electrons
    - d) None of these

- 3) Which of the following method is used when crystals of reasonably long size are not available
- (a) Powder crystal method (b) Laue method  
(c) Bragg's X-ray spectrometer (d) none of these
- 4) Which of the following has highest frequency
- (a) Visible light (b) X-rays  
(c) UV light (d) IR rays
- 5) The intensity of X-rays is determined by
- (a) Filament voltage (b) size of cathode  
(c) Filament Current (d) None of these
- 6) The production of continuous spectrum is the result of
- (a) Compton effect (b) Inverse photo electric effect  
(c) photoelectric effect (d) None of these
- 7) Heavy water is used in nuclear reactor as:
- a) Coolant  
b) moderator  
c) Both coolant and moderator  
d) Shutdown
- 8) A device in which energy is released at given rate is known as
- (a) A nuclear reactor (b) particle accelerator  
(c) A nuclear detector (d) None of these
- 9) Van de Graff accelerators impart -----to change particles by accelerating high DC voltage.
- a) High K.E.  
b) High P.E.  
c) High K.E and P.E.  
d) Low K.E.
- 10) Betatron is used to accelerate electrons to
- a) Very low energy  
b) Very high energy  
c) High as well as low energy  
d) None of these

Total No. of Printed Pages:02

**SUBJECT CODE NO:- B-2012**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. T.Y. (Sem-V) Examination Oct/Nov 2019**  
**Physics Paper- XVI**  
**Electrodynamics**

[Time: 1:30 Hours]

[Max. Marks:50]

N.B

Please check whether you have got the right question paper.

- 1) All questions are compulsory.  
 2) All questions carry equal marks.

Given Data:-

- 1)  $\epsilon_0 = 9 \times 10^{-12}$  SI units.  
 2)  $C = 3 \times 10^8$  meter/sec

- Q.1 a) State the Gauss's Law and derive an expression for electric field due to uniformly charged 10 sphere. 10  
 b) Derive an equation of continuity. 10  
 OR  
 a) Derive an expression for flow of electromagnetic energy. 10  
 b) Determine the boundary conditions satisfied by  $\vec{D}$  and  $\vec{H}$  10
- Q.2 a) Obtain Gauss law in differential form. 05  
 b) Calculate electric flux that will come through a surface  $S=20$  j kept in electric field  $E = 4\hat{i} + 2\hat{j} + 5\hat{k}$  05  
 c) Give the characteristics of electromagnetic waves. 05  
 d) If 500 watt of a laser beam is concentrated by the lens into a cross sectional area  $10^{-10}m^2$ . Find the value of poynting vector and amplitude of electric field. 05  
 OR  
 a) Derive the Maxwell's equation. 05  

$$\nabla \times E = -\frac{\partial B}{\partial t}$$
  
 b) The inductor has an inductance of 0.5H and carries the current. The current is decreasing at the uniform rate -0.05 A/s. Find the self-induced emf in the circuit. 05  
 c) State the kinematic and dynamic properties of refraction and reflection. 05  
 d) The red light through prism is shown through air onto the glass cuvette at an angle of  $45^\circ$  to the normal. At what angle, to normal does the light have it is in the glass? (Refractive index of air is 1 and glass is 1.5) 05
- Q.3 Multiple Choice Questions:- 10

- 1) Maxwell's displacement current density is given by-----

- a)  $\frac{\partial \vec{D}}{\partial t}$     b)  $\nabla \cdot \vec{D}$     c)  $J + \frac{\partial \vec{D}}{\partial t}$     d) None

- 2

Total No. of Printed Pages:02

**SUBJECT CODE NO:- B-2011**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. T.Y. (Sem-V) Examination Oct/Nov 2019**  
**Physics Paper-XV**  
**Classical & Quantum Mechanics**

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

N.B

1) All questions are compulsory.

Given Data.

$$K = 1.38 \times 10^{-23} \text{ J/K}$$

$$R = 8.31 \times 10^3 \text{ J/kmole K}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ wb / Amp}$$

$$C = 3 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ J-s}$$

$$m = 9.1 \times 10^{-31} \text{ kg}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$

- Q.1
- a) What are constraints? Explain Holonomic and Non – Holonomic constraints with examples. 10
  - b) What is Compton Effect? Derive an expression for Compton shift. 10
- OR
- a) State Heisenberg's Uncertainty Principle. Obtain it for the position momentum uncertainty. 10
  - b) Derive time dependent form of Schrodinger's wave equation. 10
- Q.2
- a) Obtain an equation for motion of simple pendulum using Lagrange's equation. 05
  - b) In a Atwood machine two blocks of masses  $m_1$  and  $m_2$  are attached at the ends of the string find the acceleration of the blocks and tension in the string. 05
  - c) Using uncertainty principle show that electron does not exist inside the nucleus. 05
  - d) The average period that elapses between the excitation of an atom and the time it emits radiation is  $10^{-8} \text{ sec}$ . Find uncertainty in the energy emitted. 05
- OR
- a) Discuss Linear momentum of photon in terms of wave vector. 05
  - b) Calculate the work function in eV for a metal having threshold wavelength  $6800 \text{ \AA}$ . 05
  - c) What are operators? Obtain momentum and energy of operator. 05
  - d) Calculate the value of lowest energy of an electron in one dimensional force. Free region of length  $3 \text{ \AA}$ . 05

## Q.3 Multiple choice questions.

10

- 1) Atwood machine is an example of \_\_\_\_ system.
  - a) Linear
  - b) Angular
  - c) Conservative
  - d) None of these
- 2) Equation of motion of simple pendulum is
  - a)  $\theta + \frac{g}{l} \sin\theta = 0$
  - b)  $\ddot{\theta} + \frac{g}{l} \sin\theta$
  - c)  $\ddot{\theta} + \frac{l}{g} \sin\theta = 0$
  - d)  $\theta + \frac{l}{g} \sin\theta = 0$
- 3) For shorter wavelength which Law holds?
  - a) Rayleigh – Jeans law
  - b) Einstein's law
  - c) Planck's law
  - d) Wein's law
- 4) In black body radiation area under curve or total energy is directly proportional to \_\_\_\_ power of temperature.
  - a) 4<sup>th</sup>
  - b) 5<sup>th</sup>
  - c) 2<sup>nd</sup>
  - d) 6<sup>th</sup>
- 5) In Davisson Germer experiment. The order of spectrum is proportional to
  - a)  $\sqrt{V}$
  - b)  $\sqrt{V^2}$
  - c)  $\sqrt{V/2}$
  - d)  $\sqrt{V^3}$
- 6) The de Broglie wavelength  $\lambda$  of an electron in  $n^{\text{th}}$  Bohr orbit is related to radius  $r$  of the orbit is
  - a)  $n\lambda = \pi r$
  - b)  $n\lambda = 2\pi r$
  - c)  $n\lambda = 4\pi r$
  - d)  $n\lambda = \frac{3}{2}\pi r$
- 7) The electron beam of wavelength  $4.35 \times 10^{-7} \text{ m}$  have energy as
  - a)  $4.566 \times 10^{-34} \text{ J}$
  - b)  $4.566 \times 10^{-17} \text{ J}$
  - c)  $4.566 \times 10^{-19} \text{ J}$
  - d)  $4.566 \times 10^{-24} \text{ J}$
- 8) For a stationary state the probability density is
  - a) Function of time
  - b) Independent of space co –ordinates
  - c) Independent of time
  - d) None of these
- 9) Which function will be normalized if
  - a)  $\int \Psi^* \Psi dv = 1$
  - b)  $\Psi^* \Psi dv = 0$
  - c)  $\int \Psi^* \Psi dv = -1$
  - d)  $\int \Psi^* \Psi dv = \infty$
- 10) Schrodinger wave equation for a moving particle contain.
  - a) First order time derivative
  - b) second order time derivative
  - c) third order time derivation
  - d) forth order time derivative