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**SUBJECT CODE NO:- L-2007**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y. (Sem-II) Examination March/April 2019**  
**Physics Paper- IV**  
**Geometrical & Physical Optics**

[Time: 1:30 Hours]

[Max.Marks: 50]

Please check whether you have got the right question paper.

- N.B
- 1) Attempt all questions.
  - 2) Use of logarithmic table and Electronic pocket calculator is allowed.
- Q.1
- a) Explain with a neat diagram and give the construction working of Ramsden eyepiece. 10
  - b) Describe and explain the phenomenon of interference in thin film due to reflected light. 10
- OR
- c) Give the theory of the plane transmission grating. Obtain an expression for its resolving power. 10
  - d) Define Polarization and give details of Fresnel's theory of optical rotation. 10
- Q.2
- a) Write a short note on Huygens eye piece. 05
  - b) If the light from Sun is falling on Ramsden's eyepiece. Locate the position of image thus formed. If the focal length of each lens of eye piece is 3 cm. 05
  - c) Explain resolving power of an optical instrument. 05
  - d) What should be minimum number of line in a grating which will just resolve in the second order lines whose wave lengths are  $5890\text{\AA}$  and  $5896\text{\AA}$ . 05
- OR
- a) Give theory of Newton's ring by reflected light. 05
  - b) A plano convex lens of radius 300 cm is placed on an optically flat glass plate and is illuminated by monochromatic light. The diameter of 8<sup>th</sup> dark ring in the transmitted system is 0.72 cm. Calculate wave length of light used. 05
  - c) Write a short note on Nicol Prism as an analyser. 05
  - d) A 20 cm long tube containing sugar solution rotates the plane of polarization by  $11^\circ$ . If the specific rotation of sugar is  $66^\circ$ . Calculate strength of solution. 05
- Q.3 Multiple Choice Questions:- 10
- 1) The number of cardinal points need for the construction of an image in the co-axial system of lenses are
    - a) Eight
    - b) Six
    - c) Four
    - d) Two
  - 2) In Huygen's eyepiece, the focal length of the field lens is
    - a) Three times the focal length of the eye lens
    - b) Equal to the focal length of the eye lens
    - c) Two times the focal length of the eye lens
    - d) Two third the focal length of the eye lens

- 3) ----- film is formed between the plano convex lens and the glass plate in Newton's ring.  
 a) Air                      b) Glass                      c) Soap                      d) Plastic
- 4) Michelson Morley experiment works on ----- principle.  
 a) Polarization                      b) Diffraction  
 c) Interference                      d) All of the above
- 5) The grating formula is given by  
 a)  $(a + b)\sin\theta = n\lambda$                       b)  $(a + b)\cos\theta = n\lambda$   
 c)  $(a + b)\sin\theta = \left(n + \frac{1}{2}\right)\lambda$                       d)  $(a + b)\cos\theta = \frac{1}{n\lambda}$
- 6) Resolving power of transmission grating is -----  
 a)  $n\lambda$                       b)  $\frac{n}{\lambda}$                       c)  $n.N$                       d)  $n/N$
- 7) The phenomenon of polarization is produced in  
 a) Selective absorption                      b) Double refraction  
 c) Reflection                      d) All of the above
- 8) The substances that rotate the plane of vibration to left are known as-----  
 a) Laevo rotatory                      b) Dextro rotatory  
 c) Upper rotatory                      d) None of these
- 9) If there are 15000 times in 3 cm on the grating surface then grating element is  
 a)  $2 \times 10^{-6}m$                       b)  $2 \times 10^{-4}m$   
 c)  $2 \times 10^{-7}m$                       d)  $2 \times 10^{-3}m$
- 10) If -----condition is satisfied then film will appear bright in the transmitted system.  
 a)  $2\mu \cos r = n\lambda$                       b)  $2\mu t \cos r = \left(2n + \frac{1}{2}\right)\lambda$   
 c) Both (a) & (b)                      d) None of the above

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**SUBJECT CODE NO:- L-2008**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y. (Sem-II) Examination March/April 2019**  
**Physics Paper-V**  
**Electricity & Magnetism**

[Time: 1:30 Hours]

[Max.Marks: 50]

N.B

Please check whether you have got the right question paper.

- 1) Attempt all question.
- 2) Use of logarithmic table and electronic pocket calculator is allowed.

- Q.1
- a) State and prove Stoke's theorem. 10
  - b) Derive an expression for electric potential due to electric dipole. 10
- OR
- c) Explain construction and working of Ballistic galvanometer. 10
  - d) Derive equation for decay of current in LR circuit. 10
- Q.2
- a) Prove the identity. 05
- $$\nabla \cdot (\phi \vec{A}) = \phi \nabla \cdot \vec{A} + \vec{A} \cdot \nabla \phi$$
- b) Prove that. 05
- $$\vec{A} \times (\vec{B} \times \vec{C}) + \vec{B} \times (\vec{C} \times \vec{A}) + \vec{C} \times (\vec{A} \times \vec{B}) = 0$$
- c) Write a short note on Biot-Savart law. 05
  - d) What is current in the wire? If the magnetic field at a distance 2m from the axis of a long straight wire is  $10 \times 10^{-15} \text{ Wb/m}^2$ . 05
- OR
- a) Obtain the relation between D, E and P. 05
  - b) Calculate the electric potential at the surface of the nucleus of gold atom whose radius is  $6 \times 10^{-15} \text{ m}$ . Atomic number of gold is 79 and charge on proton is  $1.6 \times 10^{-19} \text{ C}$ . 05
  - c) Write a short note on RC circuit. 05
  - d) In LR circuit having inductance 4H and  $R=1\Omega$  and applied D.C. emf of 6 volt is switched at  $t=0$ . Find the power dissipated in Joule heat in the circuit at  $t=4$  second. 05
- Q.3 Multiple Choice Question:- 10
- 1) If  $\vec{\nabla}\phi = -2\hat{i} + 4\hat{j} + 4\hat{k}$  then  $|\vec{\nabla}\phi| = ?$ 
    - a) 6      b) 8      c) 4      d) 2
  - 2)  $\nabla \cdot (\nabla\phi) = \text{---}$ 
    - a)  $\nabla^2\phi$       b) 0      c)  $\nabla \cdot \phi$       d) 1

- 3) Calculate the force between two charges 2 column and -1 column separated by a distance 1m in air.
- a)  $18 \times 10^9 N$     b)  $-18 \times 10^9 N$     c)  $1.8 \times 10^{-9} N$     d)  $-180 \times 10^{-9} N$
- 4) In non-polar dielectric material dipole moment when no electric field applied is
- a) Zero    b) one    c) two    d) three
- 5) The differential form of Amper's law is
- a)  $\nabla \cdot \vec{B} = \mu_0 J$     b)  $\nabla \cdot \vec{B} = \frac{\mu_0}{J}$   
 c)  $\nabla \times \vec{B} = \mu_0 J$     d)  $\nabla \times \vec{B} = \frac{\mu_0}{J}$
- 6) The Biot-Savart's law is a general modification of
- a) Kirchhoff's law    b) Lenz's law  
 c) Ampere's law    d) Faraday's law
- 7) In LCR circuit for critically over damped condition
- a)  $\frac{R^2}{4L^2} > \frac{1}{LC}$     b)  $\frac{R^2}{4L^2} < \frac{1}{LC}$   
 c)  $\frac{R^2}{4L^2} = \frac{1}{LC}$     d)  $\frac{R^2}{4L^2} = \frac{L}{C}$
- 8) If  $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$  is position vector then  $\text{div } \vec{r} = ?$
- a) 3    b) 6    c) 9    d) 12
- 9) In LR circuit, L is 500 mH and R is  $10\Omega$ , then time constant of the circuit is
- a) 0.5 sec    b) 0.05 sec    c) 5 sec    d) 50 sec
- 10) In LR circuit the current I decays from its maximum value -----to zero.
- a)  $I_0 = \frac{E}{R}$     b)  $I_0 = \frac{E}{L}$   
 c)  $I_0 = \frac{E}{C}$     d)  $I_0 = EC$

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**SUBJECT CODE NO:- L-2011**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. T.Y. (Sem-VI) Examination March/April 2019**  
**Physics Paper-XIX**  
**(Atomic, Molecular Physics & Laser)**

[Time: 1:30 Hours]

[Max.Marks: 50]

Please check whether you have got the right question paper.

- N.B
1. Solve all questions
  2. Draw the neat diagram whenever necessary.
- Q.1
- a) Explain Rutherford's atomic model, and give its drawbacks. 10
  - b) Explain in detail the different quantum numbers associated with vector atom model. 10
- OR
- a) Explain the vibration-rotation spectrum of molecule. 10
  - b) What is LASER? Explain with neat diagram Ruby laser. 10
- Q.2
- a)
    - i) Write a note on Bohr's atom model. 05
    - ii) Show that the velocity of an electron in the first Bohr's orbit is  $\left(\frac{1}{137}\right)C$ , where "C" is velocity of light. 05
  - b)
    - i) Give any two applications of Raman effect. 05
    - ii) Find the energy and angular velocity of a CO molecule in ground state, if a band length of Co is 0.110nm mass of carbon =  $1.99 \times 10^{-26}kg$ . And mass of oxygen =  $2.66 \times 10^{-26}kg$  05
- OR
- a)
    - i) State and explain Pauli exclusion Principle. 05
    - ii) Calculate total angular momentum of "d" electron in one electron atomic system. 05
  - b)
    - i) Give Biological and medical applications of Laser. 05
    - ii) Find the ratio of population of two states in He-Ne- laser that produces light of wavelength 6328 Å. At 300K if  $[h\nu = 12400 \text{ eV}]$ ,  $K = 8.6 \times 10^{-5} \text{ eV}$  and  $T = 300K$  05

Q.3 choose the correct answer:

- 1) According to Bohr's principle the relation between quantum number "n" and radius of orbit is  
 a)  $r \propto \frac{1}{n}$       b)  $r \propto n$       c)  $r \propto n^2$       d)  $r \propto \frac{1}{n^2}$
- 2) Number of spectral lines in hydrogen atom is  
 a) 3      b) 6      c) 15      d) Infinite
- 3) In stark effect the splitting of spectral line is observed in .  
 a) Strong magnetic field      b) weak magnetic field  
 c) strong electro –magnetic field      d) strong electric field
- 4) Normal Zeeman effect is possible in  
 a) He      b) Li      c) Na      d) All elements
- 5) Raman lines are  
 a) Strongly polarized      b) weakly polarized      c) Never polarized at all      d) None of these
- 6) Rotational – vibrational spectrum is observed in the ----region.  
 a) Ultraviolet region      b) Infrared region      c) X- ray region      d) Radio region
- 7) The population inversion in gaseous LASER produced by  
 a) Photon excitation      b) chemical excitation  
 c) Inelastic atomic collision      d) chemical reaction
- 8) The working of LASER based on the phenomenon of  
 a) Spontaneous emission of radiation  
 b) Stimulated absorption of radiation  
 c) Stimulated emission of radiation  
 d) None of these
- 9) If principle quantum number is 4 then orbital quantum number has values  
 a) 1,2,3,4      b) 4 only      c) 0,1,2,3      d) none of these
- 10) National science day is celebrated due to  
 a) Raman effect      b) Compton effect      c) Rayleigh's scattering      d) none of these

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**SUBJECT CODE NO:- L-2012**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. T.Y. (Sem-VI) Examination March/April 2019**  
**Physics Paper-XX**  
**(Non -Conventional Energy Sources and Optical Fiber)**

[Time: 1:30 Hours]

[Max.Marks: 50]

Please check whether you have got the right question paper.

- N.B
1. Solve all questions.
  2. Draw the neat diagram whenever necessary.
- Q.1
- a) Explain monoblade and twin blade horizontal axis wind turbine. Give their merits. 10
  - b) Explain construction and theory of lead acid battery with chemical reactions. 10
- OR
- a) Give the theory of step index mono mode optic fiber. What are its advantages and disadvantages? 10
  - b) With the help of neat diagram give the method of internal chemical vapour deposition. 10
- Q.2 (a)
- i. Write a short note on fixed dome type Biogas plant. 05
  - ii. Calculate the power of a wind turbine where wind power density is  $633.5 \text{ w/m}^2$  and swept area is  $314\text{m}^2$ . 05
- (b)
- i. What is optic fiber? Give its classification. 05
  - ii. Calculate the refractive indices of core and cladding material of optic-fiber from following data Numerical Aperture=0.35 and fractional refractive index ( $\Delta$ )=0.015. 05
- OR
- (a)
- i. Write a short note on fundamental requirements of solar cell. 05
  - ii. Calculate the power of a solar cell of area  $5\text{cm} \times 5\text{cm}$  when  $1300 \text{ w/m}^2$  solar energy is incident on earth surface. 05
- (b)
- i. Write a short note on optic fibre cable tensile loading. 05
  - ii. Calculate Numerical Aperture and acceptance angle of an optic fibre from following data. 05
- $\mu_1(\text{core}) = 1.65 \quad \mu_2(\text{Cladding}) = 1.60$
- Q.3 Choose the correct answer. 10
- 1) PV solar cell generate which type of current.
    - a) AC
    - b) DC
    - c) Both a & b
    - d) Neither a nor b



- 2) How does the refractive index vary in graded index fibre.
  - a) Radially                      b) Tangentially                      c) Transversely                      d) Longitudinally
- 3) Which type of wind mills are termed as “cross wind axis Machines”.
  - a) Horizontal axis
  - b) Vertical Axis
  - c) Both a and b
  - d) None
- 4) The solar energy has the value of solar constant as-----
  - a)  $1.4 \text{ w/m}^2$                       b)  $14 \text{ w/m}^2$                       c)  $140 \text{ w/m}^2$                       d)  $1400 \text{ w/m}^2$
- 5) Maximum wind energy available is proportional to
  - a) Air density                      b) wind velocity cube
  - c) Square of Rotor diameter                      d) All of above
- 6) Which of the following optic fibre has more distortion
  - a) Single step index                      b) Multimode step index
  - c) Graded index                      d) Glass fibre
- 7) The numerical Aperture of an optic fibre whose core and cladding are made of material of refractive Index 1.6 and 1.5 respectively is.
  - a) 0.556                      b) 0.283                      c) 0.245                      d) 0.647
- 8) A step index fiber has numerical aperture of 0.26 a core of R. I. 1.5 and core diameter  $100\mu\text{m}$  acceptance angle is.
  - a)  $1.47^\circ$                       b)  $2.21^\circ$                       c)  $15.07^\circ$                       d)  $24.5^\circ$
- 9) Which of these is not a part of modern wind turbine-----
  - a) Nacelle                      b) Yaw drive                      c) Gear box                      d) Compressor
- 10) The photovoltaic devices in the form of thin film is made up of .
  - a) Cadmium sulphate
  - b) Cadmium telluroide
  - c) Cadmium sulphide
  - d) Cadmium oxide.



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**SUBJECT CODE NO:- L-2015**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. S.Y. (Sem-IV) Examination March/April 2019**  
**Physics Paper-XI**  
**(General Electronics)**

[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 algorithmic table and calculator is allowed.

- Q.1 (a) Explain the i/p and o/p characteristics of a common emitter configuration. 10  
 (b) What is an oscillator? Explain with block diagram the essential requirement of an oscillator. 10

OR

- (a) What is a load line? How will you obtain the operating point on the dc load line? 10  
 (b) What is modulation? Obtain the expressions for frequency modulated wave along with the waveforms. 10

- Q.2 (a) Give the various applications of Zener diode. 05  
 (b) Write a note on operational amplifier. 05  
 (c) A 5 KHz audio signal is used to frequency modulate a 100 MHz carrier causing frequency deviation of 20 KHz. Determine modulation index. 05  
 (d) An amplifier has a voltage gain of 200 without feedback. The gain is reduce to 20 when a negative feedback is applied. Determine the value of  $\beta$ . 05

OR

- (a) The constant  $\alpha$  of the transistor is 0.95. What would be the change in the collector current corresponding to a change of 0.4 mA in the base current in a CE configuration? 05  
 (b) For a feedback amplifier the gain without feedback is 150 and the feedback factor  $\beta$  is 0.2. Find the gain with feedback of this circuit. If feedback is +ve. 05  
 (c) What is the basic difference between LC and RC oscillator? 05  
 (d) Write a short note on phase modulation. 05

- Q.3 Multiple Choice Questions. 10

1. In amplitude modulation

- (a) Carrier frequency is changed.
- (b) Carrier amplitude is changed.
- (c) Infinite sidebands are produced
- (d) None of these

2. A carrier wave of 100V is made to vary between 130V and 70V by the signal. The modulation index is .....

- (a) 1.0
- (b) 0.5
- (c) 0.6
- (d) 0.3

3. In FM, amplitude of the modulating signal determines
  - (a) Rate of frequency deviation
  - (b) Amplitude of frequency shift
  - (c) Distance of broadcast
  - (d) Tonal balance of transmission
4. An amplifier with the negative feedback:
  - (a) Controls the gain
  - (b) Reduces the noise
  - (c) Reduces the phase distortion
  - (d) None of these
5. A transistor introduces a phase shift of ..... between the input and the output.
  - (a)  $0^\circ$
  - (b)  $180^\circ$
  - (c)  $90^\circ$
  - (d)  $360^\circ$
6. Operational amplifier is also called as
  - (a) Differential amplifier
  - (b) Rectifier
  - (c) Oscillator
  - (d) Multivibrators
7. The h-parameters approach gives correct results for
  - (a) Large signal only
  - (b) Small signal only
  - (c) Both small and large
  - (d) None of these
8. According to the property of a tuned circuit used in L-C Oscillators, the decay rate is proportional to .....
  - (a) Shape and size of current pulse
  - (b) Time constant
  - (c) Both (a) and (b)
  - (d) None of the above
9. A transistor is a ..... operated device.
  - (a) Voltage
  - (b) Current
  - (c) Both voltage and current
  - (d) None of these
10. If reverse bias of the gate of JFET is increased, then the width of the conducting channel.....
  - (a) Is decreased
  - (b) Is increased
  - (c) Remains the same
  - (d) None of above

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**SUBJECT CODE NO:- L-2147**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y. (Sem-I) Examination March/April 2019**  
**Physics Paper-I**  
**Mechanics Properties of Matter and Sound**

[Time: 1:30 Hours]

[Max. Marks:50]

N.B 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) State and Explain Newton's law of gravitation. What is mean by gravitational constant? What are its unit and dimensions. 10
- b) Derive an expression for twisting couple on a solid cylinder. 10
- OR
- c) State and prove Bernaulli's theorem. 10
- d) What is piezo electric effect? Explain the construction and working of piezo-electric generator. 10
- Q.2 a) Discuss Interchangeability of centers of suspension and oscillation in Kater's pendulum. 05
- b) A sphere of mass 40 kg is attached by another sphere of mass 80 kg with a force equal to weight of 0.25 mg. Find the distance between centers of two spheres  
 $(G=6.89 \times 10^{-11} \text{ Nm}^2/\text{kg}^2)$ . 05
- c) Write a short note on Filter pump. 05
- d) The air pressure inside a soap bubble of diameter 7mm is 8 mm of water above atmospheric pressure. Calculate the surface tension of the soap solution. 05
- OR
- a) Write a short note on Bending moment of beam. 05
- b) A metal bar of width 2 cm and thickness 3mm supported horizontal on knife edges 80 cm apart is loaded with 50 gm at its middle point. Calculate the depression at the loaded point  
 $(\gamma=2 \times 10^{11} \text{ dynes/cm}^2)$   
 $G=980 \text{ cm/sec}^2$  05
- c) Give the conditions for good acoustical designs of room. 05
- d) A piezo – electric X cut quartz plane has a thickness of 1.5mm. If the velocity of propagation of longitudinal sound wave along the X direction is 5760 m/s. Calculate the Fundamental Frequency of the crystal. 05

## Q.3 Multiple Choice questions

- 1) The space around a body within its gravitational force of attraction is experienced is called.....
  - a) Gravitational area.
  - b) gravitational field
  - c) gravitational potential
  - d) gravitational constant
- 2) The Kater's pendulum is used to determine the value of .....
  - a) Gravitational constant
  - b) Acceleration due to gravity
  - c) Mass of earth
  - d) None of these
- 3) Young's modulus is related to .....
  - a)  $\frac{\text{strain}}{\text{stress}}$
  - b) Strain x stress
  - c)  $\frac{\text{stress}}{\text{strain}}$
  - d) None of these
- 4) Bulk modulus corresponding to ..... strain.
  - a) Volume
  - b) Shear
  - c) longitudinal
  - d) None of all
- 5) There are ..... types of energy of liquid in motion.
  - a) One
  - b) Three
  - c) two
  - d) Four
- 6) C.G.S. Unit of surface tension is .....
  - a)  $\frac{\text{Force}}{\text{length}}$
  - b)  $\frac{\text{dynes}}{\text{cm}}$
  - c)  $\frac{\text{cm}}{\text{dynes}}$
  - d)  $\frac{\text{newtons}}{\text{m}}$
- 7) The branch of physics which deals with generation, reception and propagation of sound is called.....
  - a) Acoustics
  - b) magnetostatics
  - c) Harmonics
  - d) Ultrasonics
- 8) The Acoustics of room of wall covered with absorbent material such as.....
  - a) Celotex
  - b) Audience
  - c) Asbostats
  - d) Echoes
- 9) The reverberation time of sound in a hall of volume V is given by
  - a)  $\frac{0.05V}{\sum a_i}$
  - b)  $\frac{0.1V}{\sum a_i}$
  - c)  $\frac{0.2V}{\sum a_i}$
  - d) None of this
- 10) Gravitational field at a point on the surface of solid sphere is given by.....
  - a)  $E = \frac{-mG}{r^2}$
  - b)  $E = \frac{mG}{r^2}$
  - c)  $\frac{mG}{r} = E$
  - d)  $E = \frac{r}{mG}$

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**SUBJECT CODE NO:- L-2148**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y. (Sem-I) Examination March/April 2019**  
**Physics Paper-II**  
**Heat and Thermodynamics**

[Time: 1:30 Hours]

[Max. Marks:50]

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

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

- Q.1 (a) Explain the comparison of thermal conductivity of different metal by using Ingen-Hausz experiment. 10
- (b) Derive an expression for thermal conductivity of a gas and obtain the relation between Coefficient of viscosity and thermal conductivity. 10
- OR
- (c) Describe Carnot's ideal heat engine derive expressions for work done during four stages of Carnot's cycle. 10
- (d) Derive any two Maxwell's thermodynamical relation. 10
- Q.2 (a) Write a note on coefficient of thermal conductivity. 05
- (b) Two thin concentric spherical shells of radii 5 cm; and 10 cm respectively have their annular cavity filled with charcoal power. When energy is supplied at the rate of 10.5 watt to a heater at the centre, a temperature difference of 60°C is set up between the shells; find the thermal conductivity of charcoal. (J= 4.2 Joule / cal) 05
- (c) State the second law of thermodynamics with the help of Kelvin and clausius statement. 05
- (d) A gas occupying 1 liter at 80cm of Hg pressure is expanded adiabatically to 1190 cc. If pressure fall to 60 cm of Hg in the process. Deduce value of  $\gamma$  (Gamma) 05
- OR
- (a) Explain the term mean free path and sphere of influence. 05
- (b) Calculate the mean free path of a gas molecule, given that the molecule diameter is  $2 \times 10^{-8}$  cm and the number of molecule per cc is  $3 \times 10^{19}$ . 05
- (c) Prove that  $T \cdot ds = C_p dT - T \left( \frac{\partial v}{\partial T} \right)_p dp$  05

- (d) Calculate the depression of melting point of Ice produced by 1 atmosphere increase of pressure. Given the Latent heat of ice = 80 cal/gm. Specific volume of ice and water at 0°C are 1.091 cm<sup>3</sup> and 1.0 cm<sup>3</sup> respectively

05

## Q.3 Multiple Choice questions.

10

- The process in which heat is transmitted from one place to other directly without the necessity of intervening medium is called
  - Transmission
  - Conductance
  - Convection
  - Radiation
- The dimension of thermal conductivity is.....
  - $[M^1L^1T^{-3}\theta^{-1}]$
  - $[M^1L^2T^{-3}\theta^{-1}]$
  - $[M^1L^2T^{-2}\theta^{-1}]$
  - $[M^1L^3T^1\theta^{-1}]$
- An adiabatic process occurs at constant.....
  - temperature
  - pressure
  - heat
  - None of these
- In Carnot cycle the first step is .....
  - ISO thermal expansion
  - ISO thermal compression
  - Adiabatic expansion
  - Adiabatic compression
- The efficiency of Carnot's engine working between 127°C and 27°C is .....
  - 25%
  - 50%
  - 75%
  - 100%
- Critical temperature of Carbon dioxide is .....
  - 31.1
  - 50
  - 21.1
  - 30.2
- The critical constant of pressure ( $P_c$ ) is.....
  - $\frac{a}{27b^2}$
  - $\frac{b}{27a^2}$
  - $\frac{8a}{27}$
  - $\frac{27a}{b}$
- In a reversible process the entropy of the system
  - Increases
  - Decreases
  - Remains constant
  - None of above
- The unit of entropy is
  - Joule/Kelvin
  - Cal/Kelvin
  - Both (a) and (b)
  - None of above
- Calculate the change in entropy when  $dQ=800$  Cal ,  $T=0^\circ\text{C}$ .....
  - 2.93 Cal/K
  - 2.98 Cal/K
  - 2.83 Cal/K
  - 2.85 Cal/K

Total No. of Printed Pages:2

**SUBJECT CODE NO:- L-2151**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. T.Y. (Sem-V) Examination March/April 2019**  
**Physics Paper-XV**  
**(Classical & Quantum Mechanics)**

[Time: 1:30 Hours]

[Max.Marks:50]

N.B

Please check whether you have got the right question paper.

i) All questions are compulsory.

Given Data

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

$$h = 6.63 \times 10^{-27} \text{ JS}$$

$$R = 8.31 \times 10^3 \text{ J/S mole k}$$

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

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

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

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

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

- |     |   |    |
|-----|---|----|
| Q.1 | a) Derive an expression of Lagrange's equation.   | 10 |
|     | b) Show that linear momentum of photon in terms of wave vector.<br>$P = \hbar \vec{K} $   | 10 |
|     | OR  |    |
|     | a) Derive an expression of De-Broglie Wavelength in terms of energy and temperature   | 10 |
|     | b) Derive Time-independent form of Schrodinger's equation.  | 10 |
| Q.2 | a) Using Newton's law of motion prove work energy theorem.  | 05 |
|     | b) Light of wavelength $4300 \text{ \AA}$ is incident on potassium surface of work function 2.5 ev. Find out wavelength of emitted electrons.   | 05 |
|     | c) Obtain the equation of eigen functions for particle in one dimensional box.  | 05 |
|     | d) Electron are accelerated by 355 volts are reflected from a crystal. The first reflection maximum occurs, when the glancing angle is $60^\circ$ . Determine the spacing of the Crystal. | 05 |
|     | OR  |    |
|     | a) Explain Atwood's Machine   | 05 |
|     | b) Calculate the permitted energy levels of an electron in a box of $1 \text{ \AA}$ wide.   | 05 |
|     | c) Find the relation between group velocity and phase velocity.   | 05 |
|     | d) Calculate the longest wavelength of the incident radiation which will eject electrons from a metal work function is 7 ev, Planck's constant $h=6.62 \times 10^{-34} \text{ J/S}$ .     | 05 |



## Q.3 Multiple Choice questions.

10

- In the absence of external torque angular momentum of a particle is .....  
a) Constant      b) Conserved      c) Not conserved      d) None of these
- The force of Constraints obeys  
a) Newton's gravitation law  
b) Frictional law  
c) Newton's third law of motion  
d) None of these
- Which law holds good for longer wavelength?  
a) Planck's law      b) Rayleigh – Jeans law      c) Weins law      d) Einstein law
- The energy of a quantum of light of wavelength  $5.4 \times 10^{-7} \text{ m}$  is  
a) 2.20 ev      b) 2.12 ev      c) 2.30 ev      d) 1.5 ev
- The De-Broglie's wavelength  $\lambda$  of an electron in  $n^{\text{th}}$  Bohr orbit is related to the radius  $r$  of the orbit is  
a)  $n\lambda = 2\pi r$       b)  $n\lambda = \pi r$       c)  $n\lambda = 4\pi r$       d)  $n\lambda = \frac{3}{2}\pi r$
- Devisson and Germer experiment is related to .....  
a) Polarization      b) Diffraction      c) Interference      d) None of these
- Probability density is  
a)  $P = |\Psi|^2$       b)  $P = \Psi$       c)  $P = 2\Psi$       d)  $P = \Psi/2$
- Grain dust of mass  $10^{-9} \text{ kg}$  moves between two walls separated by  $10^{-4} \text{ m}$  and it required 100 sec to cross the gap what is it's grain energy.  
a)  $2 \times 10^{-22} \text{ J}$       b)  $5 \times 10^{-22} \text{ J}$       c)  $3 \times 10^{-22} \text{ J}$       d)  $8 \times 10^{-22} \text{ J}$
- For a free particle the potential energy is .....  
a) 1      b) -1      c) 0      d)  $\infty$
- The concept of duality is firstly proposed by.....  
a) Einstein      b) Thomson      c) Taylor      d) De-Broglie

Total No. of Printed Pages:2

**SUBJECT CODE NO:- L-2152**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. T.Y. (Sem-V) Examination March/April 2019**  
**Physics Paper- XVI**  
**(Electrodynamics)**

[Time: 1:30 Hours]

[Max. Marks:50]

N.B

Please check whether you have got the right question paper.

- i) Attempt all questions.  
 ii) All questions carry equal marks  
 Given

$$\mu_0 = 4\pi \times 10^{-7} \text{ S.I units}$$

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ S.I units}$$

- Q.1 a) Derive an expression for Electric field intensity of charged sphere and charged cylinder at an outside point using Gauss law. 10
- b) What is electromagnetic wave? Give its characteristics and hence explain plane polarized Electromagnetic wave. 10
- OR
- a) Derive an expression for displacement current. 10
- b) Discuss the boundary conditions for electric field vectors B and D across the interface between two media. 10
- Q.2 a) The flux in a closed circuit of resistance  $10\Omega$  varies with time as  $\phi = 6t^2 - 5t + 1$  find magnitude of induced current at  $t=0.25$  sec. 05
- b) The angle of incidence and refraction are  $60^\circ$  and  $30^\circ$  respectively if refractive index of rarer medium is 1.25 find refractive index of denser medium. 05
- c) Explain Poisson's and Laplace equations. 05
- d) Explain boundary conditions for magnetic field vector H. 05
- OR
- a) Explain Electric field lines and electric flux. 05
- b) Explain self induction and mutual induction and derive their S.I.units. 05
- c) Calculate the value of Poynting vector at 25 cm from a lamp working 220V and 1.5A current. 05
- d) Calculate the velocity of electro-magnetic wave in vacuum. 05

## Q.3 Multiple Choice questions.

10

- If there is no net outward flux of current density  $J$  and lines of electric current are continuous then
  - $\text{Curl } H \neq 0$
  - $\nabla \cdot J \neq 0$
  - $\nabla \cdot J = 0$
  - $\text{Curl } H = 0$
- Which of the following electric and magnetic field vectors are continuous.
  - $B$  and  $D$
  - $B$  and  $E$
  - $E$  and  $D$
  - $D$  and  $H$
- Which of the following waves cannot be polarized.
  - Radio waves
  - X-rays
  - Ultrasonic waves
  - Ultraviolet waves
- A point charge of  $5 \times 10^{-6} \text{ C}$  is situated at the centre of cube of  $1\text{m}$  side. The electric flux through its surface is
  - $5.65 \times 10^6 \text{ Vm}$
  - $5.65 \times 10^5 \text{ Vm}$
  - $5.65 \times 10^{10} \text{ Vm}$
  - $5.65 \times 10^8 \text{ Vm}$
- The magnitude of electric field on the surface of a sphere of radius  $r$  having a uniform surface charge density  $\sigma$  is
  - $\frac{\sigma}{2\varepsilon_0}$
  - $\frac{\sigma}{2\varepsilon_0 r}$
  - $\frac{\sigma}{\varepsilon_0}$
  - $\frac{\sigma}{2\varepsilon_0 r}$
- Displacement current is
  - DC current
  - Zero magnitude current
  - Pulsating DC
  - Changing current
- If a conductor is rotating about its one end in a plane perpendicular to uniform magnetic field. Then emf induced in it is
  - $BA\omega$
  - $BIA\omega$
  - $BA\omega^2$
  - $B\omega$
- The magnetic field in a travelling electromagnetic wave has peak value of  $20\text{nT}$ . The peak value of electric field strength is
  - $3\text{V/m}$
  - $6\text{V/m}$
  - $9\text{V/m}$
  - $12\text{V/m}$
- Inside charged metal sphere if  $E$  is electric field and  $V$  is electric field potential. Then
  - $E=0, V=0$
  - $E \neq 0, V \neq 0$
  - $E=0, V \neq 0$
  - $E \neq 0, V=0$
- If  $N$  is the number of turns in a coil. The value of self induction varies as
  - $N^0$
  - $N^1$
  - $N^{-2}$
  - $N^2$