

Total No. of Printed Pages:2

SUBJECT CODE NO:- L-2003
FACULTY OF SCIENCE
B.Sc. T.Y. (Sem-V) Examination Oct/Nov 2018
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
2. All questions carry equal marks.

Given data –

$$k = 1.38 \times 10^{-23} \text{ J/K} ; h = 6.63 \times 10^{-34} \text{ J.s}$$

$$R = 8.31 \times 10^3 \text{ J/k mole } k \quad m_e = 9.1 \times 10^{-31} \text{ kg}$$

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

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

$$I_e v = 1.6 \times 10^{-19} \text{ J}$$

- Q.1 a) State and prove D' Alembert's principle. 10
 b) Explain in detail Planck's Quantum theory and its postulates. 10

OR

- a) Derive the relation between wave (phase) velocity and particle velocity. 10
 b) Discuss the problem of particle in one dimensional box and prove that energy of particle of the 10
 particle quantized.

- Q.2 a) Explain the principle of virtual work. 05
 b) A point mass moves in a vertical plane along a given curve in a gravitational field. The 05
 equation of motion in parametric form is $X=x(s)$, $Z=Z(s)$. Write down the Lagrange
 equation.
 c) Describe and explain Heisenberg's uncertainty principle.
 d) A microscope using photons is employed to locate an electron in an atom to within a 05
 distance of 0.4 \AA . what is the uncertainty in moment of the electron located in this way. 05

OR

- a) Derive Einstein's photoelectric equations. 05
 b) Calculate the longest wave length of the incident radiation which will eject electrons from a 05
 metal work function is 8 electron volts. Planck's constant is $h = 6.624 \times 10^{-34} \text{ J.second}$.
 c) What is wave function? Explain it's physical interpretation. 05
 d) Calculate the value of lowest energy level of an electron in one dimensional box of 1 \AA wide. 05

Q.3 Multiple choice questions.

10

- 1) The constraints involved when particle is restricted to move along a curve of surface are
a) Holonomic b) non Holonomic c) Both a & b d) none of these
- 2) $\delta w = \sum_{i=1}^N F_i^a \delta r_i = 0$ represents
a) D'Alemberts principle b) virtual work done c) Lagrangian equations d) none of these
- 3) The absorptive power of a perfectly black body is
a) 0.5 b) 1 c) zero d) Infinity
- 4) Planck's radiation law holds for -----
a) Shorter wave length b) longer wave length c) All wave lengths d) None of these
- 5) Which represents De- Broglie's wave length
a) $\lambda = \frac{h}{mv}$ b) $\frac{h}{mv}$ c) $\lambda = \frac{h}{m^2 v^2}$ d) $\lambda = \frac{h}{mv^2}$
- 6) Which relation is correct
a) $V = n\lambda$ b) $K = \frac{2\pi}{\lambda}$ c) $V_g = \frac{\partial w}{\partial K}$ d) All of these
- 7) Davisson and Germer Experiment is related to
a) Interference b) polarization c) Diffraction d) All of above
- 8) The quantity $|\psi|^2$ represents
a) Probability density b) charge density c) Energy density d) wave density
- 9) A rule by means of which a given function can be change into another function is called as
a) Function b) operator c) Eigen values d) none of these
- 10) The energies of a particle in a box are
a) Discrete energies b) continuous energies
c) only single value energies d) All of these

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SUBJECT CODE NO:- L-2004
FACULTY OF SCIENCE
B.Sc. T.Y. (Sem-V) Examination Oct/Nov 2018
Physics Paper- XVI
(Electrodynamics)

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- N.B
1. All questions are compulsory.
 2. All questions carry equal marks.
- Given data :-
- 1) $\epsilon_0 = 9 \times 10^{-12} SI \text{ units}$
 - 2) $C = 3 \times 10^8 \text{ meter/sec}$
 - 3) $\mu_0 = 4\pi \times 10^{-7} \text{ weber/Amp}$
- Q.1
- a) Define electric flux. State and prove Gauss theorem. 10
 - b) State Maxwell's four equations and prove any two. 10
- OR**
- a) Obtain an electromagnetic wave equation of electric field \vec{E} and magnetic field \vec{B} in a conducting medium. 10
 - b) Explain the boundary condition of \vec{B} and \vec{E} at the interface between two media. 10
- Q.2
- a) Write a note on 'Gaussian Pillbox'. 05
 - b) If the electric field is given by $\vec{E} = 8\vec{i} + 4\vec{j} + 9\vec{k}$, calculate the electric flux through a surface area 200 units lying in yz plane. 05
 - c) Explain transverse nature of electromagnetic waves. 05
 - d) If 800 watt of laser beam is focused into a cross sectional area 10^{-12} meter^2 find Poynting vector and electric field. 05
- OR**
- a) State and explain faraday's and Lenz's law. 05
 - b) When the current in primary changes from 7Amp. To zero in $15\mu s$, an emf of $6 \times 10^5 \text{ volt}$ is induced in the secondary calculate the mutual inductance. 05
 - c) State Snell's law of refraction. Draw a ray diagram of reflection and refraction at the boundary of two non- conducting media. 05
 - d) The red light through prism, is shown through air on to the glass curette at an angle of 30° 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) Gauss law in differential form is –
 - a) $\nabla \times \vec{E} = \frac{\rho}{\epsilon_0}$
 - b) $\nabla \cdot \vec{E} = \frac{\rho}{\epsilon_0}$
 - c) $\nabla \cdot \vec{E} = \rho \cdot \vec{\epsilon}_0$
 - d) $\nabla \times \vec{E} = \rho \times \epsilon_0$
- 2) The electric field outside the uniformly charged solid sphere of radius R is -----
 - a) $\frac{\rho R^3}{3\epsilon_0 r^3}$
 - b) $\frac{\rho R^2}{3\epsilon_0 r^2}$
 - c) $\frac{\rho R^3}{3\epsilon_0 r^2}$
 - d) $\frac{\rho R^4}{3\epsilon_0 r^2}$
- 3) The electric field is produced by a distribution of charge
 - a) Gauss
 - b) coulomb
 - c) stoke
 - d) faraday
- 4) Maxwell's displacement current term is –
 - a) $J + \frac{\partial \vec{D}}{\partial t}$
 - b) $\frac{\partial \vec{D}}{\partial t}$
 - c) $\nabla \cdot \vec{D}$
 - d) $\nabla \times \vec{D}$
- 5) Transformer works on the principle of
 - a) Self-inductance
 - b) electric flux
 - c) mutual inductance
 - d) self and mutual inductance .
- 6) ----- gives direction of propagation of electromagnetic wave
 - a) $\vec{E} \times \vec{B}$
 - b) $\vec{E} \times \vec{D}$
 - c) $\vec{H} \times \vec{E}$
 - d) $\vec{B} \times \vec{D}$
- 7) Electromagnetic waves travel in Vacuum with velocity –
 - a) $\frac{1}{\mu\epsilon}$
 - b) $\frac{1}{\sqrt{\mu_0\epsilon_0}}$
 - c) $\sqrt{\mu_0\epsilon_0}$
 - d) $\mu\epsilon$
- 8) The tangential component of electric field \vec{E} is ----- across the interface.
 - a) Continuous
 - b) discontinuous
 - c) large
 - d) small
- 9) Incident, reflected and refracted waves lie in the ----- plane but normal to the boundary surface.
 - a) Tangent
 - b) same
 - c) different
 - d) none
- 10) The frequency of the wave remains unchanged by -----
 - a) Incidence & reflection
 - b) Reflection & refraction
 - c) Refraction
 - d) Reflection

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SUBJECT CODE NO:- L-2015
FACULTY OF SCIENCE
B.Sc. F.Y. (Sem-I) Examination Oct/Nov 2018
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.

N.B

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

- Q.1
- a) Obtain an expression for gravitational potential and field due to a solid sphere at a point outside it. 10
 - b) Derive an expression for Young's modulus of a material of a cantilever loaded at free end with effective load. 10
- OR**
- a) Derive Poiseuille's formula for the rate of flow of a liquid through capillary tube. 10
 - b) What are ultrasonic waves? Describe in detail magnetostriction oscillator for production of ultrasonic waves. 10
- Q.2
- a) Write a note on kater's pendulum. 05
 - b) Find the minimum time period of a compound pendulum if the distance of its point of suspension from the centre of gravity is 123cm and $g = 984 \text{ cm/sec}^2$. What will be the value of radius of gyration. 05
 - c) Obtain an expression for surface tension by jaeger's method. 05
 - d) An air bubble situated just below the surface of water has a diameter 1 cm. what is the pressure within the bubble? The atmospheric pressure on the surface is 10^6 dynes/cm^2 and the surface tension is 70 dynes/cm? 05
- OR**
- a) Write note on cantilever loaded at a center. 05
 - b) A steel rod of circular cross section of radius 1cm is rigidly fixed at one end, the other end which is at a distance of 1 meter from the fixed end is loaded with 8kg. calculate the deflection of the end
(given $Y = 2 \times 10^{12} \text{ dynes/cm}^2$) 05

c) Write a note on piezoelectric oscillator.

05

d) A quartz crystal of thickness 0.002m is vibrating at resonance. Calculate the fundamental frequency. (y for quartz = $7.9 \times 10^{10} \text{ Newton/m}^2$ & $\rho = 2650 \text{ kg/m}^3$)

05

Q.3 Multiple Choose questions.

10

1. The gravitational potential at a point on the outer surface of the spherical shell of mass M and radius R is.....

a) $\frac{GM}{R}$

b) $-\frac{GM}{R^2}$

C) $\frac{GM}{R^2}$

D) $-\frac{GM}{R}$

2. If the distance between two point masses is doubled the gravitational attraction between them.....

a) is reduced to a quarter

b) is double

c) becomes four times

d) is reduced to half

3. The gravitational field potential at a distance r from a solid sphere is X. The solid sphere is now replaced by an identical hollow sphere of the same mass. The gravitational field potential changes from x to y,

$$\text{ratio } \frac{x}{y} = \text{-----}$$

a) 1

b) 0

c) -1

d) infinite

4. Shearing strain is given by-----

a) Deforming force

b) shape of shear

c) Angle of shear

d) change in volume of the body.

5. Ultrasonic waves is used in measurement of-----

a) Volume of gas

b) Atmospheric pressure

c) depth of sea

d) none of these

6. The force per unit length acting normally along a line tangent to its free surface of liquid is called-----

a) Pressure

b) viscosity

c) surfaces tension

d) Angle of contact

7. Ultrasonic waves are-----

a) Longitudinal waves

b) Perpendicular wave

c) Parallel wave

d) Troms verse wave.

8. If by applying a force the shape of the body is change then the corresponding stress is known as-----
- a) Compressive stress
 - b) Shearing stress
 - c) Bulk stress
 - d) Tensile stress
9. Filter pump is used to generate -----
- a) Electricity
 - (b) Force
 - c) vacuum
 - d) pressure
10. Unit of viscosity is-----
- a) Poise
 - b) newton
 - c) dynes
 - d) None of these

Total No. of Printed Pages:2

SUBJECT CODE NO:- L-2016
FACULTY OF SCIENCE
B.Sc. F.Y (Sem-I) Examination Oct/Nov 2018
Physics Paper-II
Heat and Thermodynamics

[Time: 1:30 Hours]**[Max.Marks:50]**

Please check whether you have got the right question paper.

- N.B 1. Attempt all questions.
 2. Illustrate your answer with suitable labeled diagram.
- Q.1 a) Derive the equation for rectilinear flow of heat along a bar. 10
 b) Define critical constant. Derive an expression for critical constant for volume, temperature and pressure. 10
 OR
 c) What is isothermal process? Derive an expression for work done during isothermal process. 10
 d) Using Maxwell's thermo dynamical relation, derive clausius clapeyron latent heat equation explain the effect of pressure on boiling point of liquid and melting point of solid. 10
- Q.2 a) Define temperature gradient and coefficient of thermal conductivity. Establish equation of heat conduction. 05
 b) In an Ingen Hausz's experiment, wax melted over 10 cm of copper rod and over 4 cm of iron rod. What is the conductivity of iron when the conductivity of copper in 0.9? 05
 c) Describe the term reversible and irreversible process. 05
 d) Find the efficiency of the Carnot's engine working between the steam point and ice-point. 05
 OR
 a) Give the reason for modification of gas equation. 05
 b) Calculate the Van-der-Waals constants for dry air, given that $T_c = 132 \text{ K}$ $P_c = 37.2$ atmospheres and R per mole = $82.07 \text{ cm}^3 \text{ atmos K}^{-1}$. 05
 c) Prove that $T \cdot ds = C_v dT + T \left(\frac{\partial P}{\partial T} \right)_v dv$ 05
 d) Calculate the change in entropy when 10 kg of water at 200°C converted into steam of the same temperature (latent heat of steam = 540 cal/gm) 05

Q.3 Multiple choice questions.

- 1) The rate flow of heat through a metal bar of area of cross-section 1 m^2 . When temperature gradient in $1^\circ\text{C}/\text{m}$ under steady state is called -----
 a) Thermal resistance b) Thermal conductivity
 c) Diffusivity d) Resistivity
- 2) The SI unit of thermal conductivity is measured by
 a) $\text{JS m}^{-1} \text{ } ^\circ\text{C}^{-1}$ b) $\text{J S}^{-1} \text{ m}^{-1} \text{ } ^\circ\text{C}^{-1}$ c) $\text{JS m}^{-1} \text{ } ^\circ\text{C}$ d) $\text{JS}^{-1} \text{ m}^0 \text{ } ^\circ\text{C}^{-1}$
- 3) The efficiency of Carnot's engine working between 30°K and 300°K in
 a) 50% b) 47% c) 90% d) 10%
- 4) Adiabatic equation of a perfect gas is
 a) $P^V V = \text{constant}$ b) $PV = RT$ c) $(PV)^V = \text{constant}$ d) $PV^V = \text{constant}$
- 5) Heat engine is practical machine which converts -----
 a) Heat into mechanical work
 b) Heat into energy
 c) Mechanical work in heat
 d) None of these
- 6) Viscosity of a gas is due to transport of -----
 a) Momentum b) energy c) mass d) none of these
- 7) The mean free path of gas raises with absolute temperature (T) as -----
 a) T^2 b) T^{-1} c) T d) T^4
- 8) The value of critical volume V_c according to Van-der-Waals gas equation is
 a) $V_c = b$ b) $V_c = 3b$ c) $V_c = 2b$ d) $V_c = 8b$
- 9) If dQ is small quantity of heat absorbed or rejected at temperature T in going from one adiabatic to other then change in entropy is
 a) $\frac{T}{dQ}$ b) $\frac{dQ}{T^2}$ c) $\frac{dQ}{T}$ d) T^2/dQ
- 10) Entropy is a measure of -----
 a) Perfect order b) disorder c) available energy d) none of the above

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SUBJECT CODE NO:- L-2021
FACULTY OF SCIENCE
B.Sc. S.Y. (Sem-III) Examination Oct/Nov 2018
Physics -VII
Mathematical Statistical Physics and Relativity

[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 logarithmic table & electronic pocket calculator is allowed.

- Q.1
- a. Obtain solution of second order linear inhomogeneous differential equation with constant coefficients. Find particular integral (P.I.) in special case for exponential right hand side. 10
 - b. Derive an expression $E_f = \frac{h^2}{8m} \left(\frac{3N}{\pi v} \right)^{2/3}$ the Fermi energy for free electron in a metal. 10
- OR**
- a. Obtain the Maxwell Boltzmann distribution law. 10
 - b. Obtain Galilean transformation equation and show that acceleration is invariant under Galilean transformation. 10
- Q.2
- a. Distinguish between M.B. and F.D. statistics. 05
 - b. Define successive differentiation. Explain successive differentiation of a function. 05
 - c. Calculate the thermodynamic probability of (1,4) macro state corresponding to distribution of 5 particles into two compartment. 05
 - d. A π meson has a mean lifetime of 2×10^{-8} sec when measured at rest. What is the lifetime if it moves with the speed of $0.99c$? 05
- OR**
- a. If $F(x,y) = x^6 + x^3y^3 + y^6$ then show that $\frac{\partial^2 f}{\partial y \partial x} = \frac{\partial^2 f}{\partial x \partial y}$ 05
 - b. A gas has only two particles a and b. Show with the help of diagrams how these two particles can be arranged in three quantum series 1,2,3 using M.B. statistics. 05
 - c. Explain the concept of division of compartments into cells. 05
 - d. What is time Dilation. Obtain equation for it. 05
- Q.3 Attempt all 10
- i. If $x^2y + xy^2 - 5xy$ then f_{yy} is
 - a. $2y$
 - b. $2xy$
 - c. $2yx$
 - d. $2x$
 - ii. The notations f_{yx} , f_{xy} , f_{2x} are called as
 - a. Mixed partial derivatives
 - b. partial derivatives
 - c. mixed 1st order partial derivatives
 - d. mixed 2nd order partial derivatives

- iii. If for a particle spin angular momenta are odd half integral multiples of \hbar then wave function is
 a. Symmetric b. antisymmetric c. quasisymmetric d. none of the above
- iv. Oxygen molecules are classical particles therefore they obey
 a. B.E. statistic b. M.B. statistics c. F.D. statistics d. All above
- v. M.B. distribution law is obeyed by
 a. Photons b. fermions c. ideal gas molecules d. none of the above
- vi. In classical statistics (M.B.) size of the phase space or cell can be
 a. As small as possible b. very large c. both of the above d. none of the above
- vii. Particles obeying M.B. statistics have
 a. Odd spin b. zero spin c. even spin d. no spin
- viii. According to time dilation, the relation in the two frames between the time interval of an event is given by
 a. $t = \frac{t_0}{\sqrt{1 - v^2/c^2}}$ b. $t = t_0 \sqrt{1 - v^2/c^2}$
 c. $t = t_0/1 - v^2/c^2$ d. $t = t/1 - v^2/c^2$
- ix. Nuclear fusion and fission reactions are good examples of _____.
 a. Length contraction b. time dilation c. energy-mass relation d. relativity
- x. The effects of relativity can be seen only when the frame moves with a velocity that is _____ with the velocity of light.
 a. Smaller b. comparable c. larger d. none of these

Total No. of Printed Pages:02

SUBJECT CODE NO:- L-2022
FACULTY OF SCIENCE
B.Sc. S.Y. (Sem-III) Examination Oct/Nov 2018
Physics - VIII
Modern and Nuclear Physics

[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 logarithmic table and electronic pocket calculator is allowed.

- Q.1
- a. Explain the construction and working a photovoltaic cell. 10
 - b. Explain briefly the nuclear shell model. 10
- OR**
- a. Write in brief Bragg's spectrometer. 10
 - b. Explain in detail Betatron. 10
- Q.2
- a. Write a note on photo-emissive cell. 05
 - b. Write a note on absorption of X-rays. 05
 - c. Two isotopes of oxygen ${}_8O^{16}$ and ${}_8O^{18}$ having nuclear masses 15.990523 a.m.u and 17.994768 a.m.u. calculate the binding energy per nucleon in two cases in mev. 05
- Given: mass of proton= 1.007276 a.m.u.
 Mass of neutron= 1.008665 a.m.u.
- d. An alpha particle losses all of its energy in a gas and produces 1,28,500 ion pairs. If energy required to create one ion pair is 28 ev. What is the energy of an alpha particle? 05
- OR**
- a. Calculate the value of external magnetic field required in Lenard's e/m methods, if applied anode potential is 3 KV and radius of helical path of electron is 2 cm. 05
 - b. The glancing angle for second order X-rays spectrum was observed to be 18° . Calculate wave length of X-rays if $d=2.62 \text{ \AA}$. 05
 - c. Write a note on chain reaction. 05
 - d. Explain basic idea of proportional counter. 05
- Q.3 Attempt all questions. 10
1. In photoelectric effect saturation current changes with
 - a. Critical potential
 - b. frequency
 - c. dynode
 - d. intensity of illumination
 2. Photon energy corresponding to a wavelength is
 - a. $\frac{hc}{\lambda}$
 - b. $\frac{h}{\lambda c}$
 - c. $\frac{\lambda}{hc}$
 - d. $\frac{\lambda c}{h}$
 3. Just as a photon a quantum of electromagnetic field, a meson is a quantum of
 - a. Nuclear field
 - b. electromagnetic field
 - c. electric field
 - d. Magnetic field

4. When a alpha particle is emitted from unstable nucleus, the atomic mass number of the nucleus
 - a. Increases by 2
 - b. decreases by 2
 - c. Increases by 4
 - d. decreases by 4
5. Which one of the isotope of the Uranium can cause fission reaction
 - a. U^{235}
 - b. U^{234}
 - c. U^{237}
 - d. U^{238}
6. Ionization chamber is used in
 - a. Nuclear power industry
 - b. research lab
 - c. radio graphy
 - d. all of the above
7. In van de Graff accelerator charge leaks through at pointed edge of the charged conductor by
 - a. Speedy discharge
 - b. slowly discharge
 - c. corona discharge
 - d. None of these
8. _____ used in the acceleration are the merits of cyclotron
 - a. Small size and large voltages
 - b. large size and small voltages
 - c. large size and large voltages
 - d. small size and small voltages
9. Absorption coefficient is equal to the fractional decrease in the intensity of X-rays permit _____ of absorber sheet.
 - a. Intensity
 - b. current
 - c. length
 - d. thickness
10. In the GM counter the particles can be detected and counted from
 - a. The pulses obtained
 - b. frequency
 - c. current
 - d. none of these

Total No. of Printed Pages:2

SUBJECT CODE NO:- L-2050
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y. (Sem-VI) Examination Oct/Nov 2018
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 Bohr's atom model. Derive expression for radius of hydrogen atom. 10
 - b) What is Zeeman effect? Explain normal Zeeman effect with its experimental arrangement. 10
- OR
- a) Obtain an expression for rotational energy level of diatomic molecule. 10
 - b) What is laser? Explain construction and working of Ruby laser? 10
- Q.2
- a) i) Discuss drawbacks of Ruthertorot's atomic model. 05
 - ii) Calculate the rotational energy of a diatomic molecule corresponding to $J=2$ level if the rotational energy for $J=1$ level is $0.5 \times 10^{-32} J$ 05
 - b) i) Explain L-S coupling scheme. 05
 - ii) Find the ratio of population of two states in He-Ne laser that produces light of wavelength 6328 \AA at 27°C 05
- OR
- a) i) Explain J.J Thomson atom model . 05
 - ii) Calculate the ratio of rotational energy of a diatomic molecule corresponding to $J=1$ and $J=2$ level 05
- OR
- b) i) Explain the selection rules. 05
 - ii) calculate the wavelength of the He-Ne laser if neon atom jumps from $E_2 = 20.66 \text{ eV}$ to $E_1 = 18.70 \text{ eV}$ 05

Q.3 choose the correct answer

10

- 1) According to classical theory the proposed circular path of an electron in Rutherford's atom will be
a) Circular b) spiral c) straight line d) parabolic
- 2) Which series of hydrogen atom observe in visible region
a) Lyman series b) Balmer series c) paschen series d) Brackett series
- 3) The value of spin quantum number of an electron in H- atom is
a) $-\frac{1}{2}$ b) $+\frac{1}{2}$ c) 1 d) 0
- 4) Raman lines are -----
a) Strongly polarized b) weakly polarized c) never polarized d) Both a and b
- 5) Normal Zeeman effect is obtained in
a) Weak electric field b) strong electric field
c) strong magnetic field d) weak magnetic field
- 6) In Rayleigh's scattering the scattered light has the ---- frequency.
a) Different b) less c) Greater d) same
- 7) The method of producing population inversion is called
a) Population b) stimulated absorption c) pumping d) none of the above
- 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) The total orbiting energy of electron in n^{th} Bohr orbit is
a) $13.6/n^2$ ev b) 13.6 ev c) $13.6/n$ ev d) $n^2/13.6$ ev
- 10) The ratio of energy of rotational level for J=1 to J=2 is -----
a) 1:3 b) 1:2 c) 3:1 d) 2:1

Total No. of Printed Pages:02

SUBJECT CODE NO:- L-2051
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y. (Sem-VI) Examination Oct/Nov 2018
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 diagram wherever necessary.
- Q.1
- a) With the help of neat labeled diagram explain fixed dome type biogas plant. 10
 - b) Explain construction and working of lead acid battery. 10
- OR**
- a) What are optical fibres? Explain characteristics of tapered optical fibre. 10
 - b) Explain internal chemical vapour deposition (CVD) method for optical fibre fabrication. 10
- Q.2
- a) I) Write a note on solar energy. 05
 - II) Calculate NA and acceptance for symmetrical fibre having $\mu(\text{core})=3.5$ and $\mu(\text{cladding})=3.45$. Surrounding medium is air ($\mu_0 = 1$) 05
 - b) I) Explain axial vapour disposition method for fibre fabrication. 05
 - II) Calculate maximum power of solar cell if maximum voltage is 0.20 volt and maximum current is 5 mA. 05
- OR**
- a) I) Write a note on geothermal energy. 05
 - II) A step index fibre has a core diameter of $200 \mu\text{m}$ and $\text{NA}=0.29$. Calculate the number of propagating modes at an operating wavelength of 850 nm. 05
 - b) I) Write a short note on V-I characteristics of solar cell. 05
 - II) Calculate the strain on the fibre from the following data: 05
- The cladding radius of fibre is $125 \mu\text{m}$ and is bent along a curve of radius 0.05m.
- Q.3 Choose the correct answer. 10
- 1) Band width of optical fibre is ----- the equivalent wire transmission line.
 - a) Higher than
 - b) lower than
 - c) equal to
 - d) lower than or equal to

- 2) Optical fibre consisting of three section that is core, cladding and -----
 a) Outer core b) inner core c) jacket d) outer jacket
- 3) The power delivered by a solar cell varies with -----
 a) Voltage applied b) intensity of sun light
 c) content of water d) none of these
- 4) Solar PV pannels delivers ----- power.
 a) Magnetic b) electromagnetic c) ac electrical d) dc electrical
- 5) The optical fibre uses ----- as its cladding.
 a) Aluminium b) plastic c) steel d) rubber
- 6) High purity silica fibre is suitable for transmission of light in the range-----
 a) 180 to 800 nm b) 180 to 800 m
 c) 0.180 to 8000 m d) 8000 to 16000 m
- 7) In internal chemical vapour deposition method, the outer diameter to core diameter ratio should be
 a) 1:3 b) 3:1 c) 2:3 d) 3:2
- 8) The central part of optical cable is -----
 a) Core b) cladding c) jacket d) buffer
- 9) Solar cells are connected in ----- to form a string.
 a) Series b) parallel c) anti parallel d) diagonal
- 10) The wind turbine generator converts wind power into -----power.
 a) Solar b) magnetic c) electrical d) wind.

Total No. of Printed Pages:2

SUBJECT CODE NO:- L-2151
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc F.Y. (Sem-II) Examination Oct/Nov 2018
Physics Paper- IV
Geometrical & Physical Optics

[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 logarithmic table and electronic calculator is allowed.

- Q.1**
- What are cardinal points of a thick lens? Describe the position of cardinal points for a thick lens. 10
 - Describe the formation of newton's rings by reflected light and determine the radius of dark rings and bright rings. 10
- OR**
- What is resolving power? Deduce an expression for resolving power of prism. 10
 - Describe Huygens's theory of double refraction in uniaxial crystal. 10
- Q.2**
- Write a note on Ramsden's eyepiece. 05
 - The focal length of eyepiece of Huygen's eyepiece is 4cm. Calculate the equivalent focal length of Huygen's eyepiece. 05
 - Write a short note on resolving power of optical instrument. 05
 - Calculate the minimum thickness of the base of prism which will just resolve the D_1 & D_2 lines of sodium. Given μ for wave length $6563\text{\AA} = 1.6545$ & for wavelength $5270\text{\AA} = 1.6635$. 05
- OR**
- Write a short note on wedge shaped thin film. 05
 - In newton's ring experiment the diameter of the 15th ring was found to be 0.590 cm and that of 5th ring was 0.336. if the radius of the plano-convex lens is 100cm. calculate the wavelength of light used. 05
 - Write a short note on Malu's law. 05
 - Calculate the quantity of sugar contained in the tube in the form of a solution, if strength of solution is 0.0833 g/cm^3 and it has a volume of solution 48 cm^3 which produces optical rotation. 05
- Q.3** Multiple choice question. 10
- A thick lens has _____ cardinal points.
 - 6
 - 4
 - 3
 - 8

2. In Ramsdin's eyepiece, the distance of first focal point from the field lens is given by
 - a. $\frac{3f}{2}$
 - b. $\frac{-f}{4}$
 - c. $\frac{-3f}{2}$
 - d. $\frac{f}{4}$
3. Newton's rings can be viewed through a
 - a. Microscope
 - b. telescope
 - c. gyroscope
 - d. none of the above
4. In Michelson's Interferometer, if two mirrors are mutually perpendicular, then the types of fringes observed are
 - a. Circular
 - b. straight
 - c. white light
 - d. both (a) & (b)
5. The resolving power of prisim can be expressed as
 - a. $\frac{\lambda}{d\lambda} = nN$
 - b. $\frac{\lambda}{d\lambda} = t \frac{d\mu}{d\lambda}$
 - c. $\frac{1}{\theta} = \frac{2\mu \sin \theta}{1.22\lambda}$
 - d. $\frac{1}{\theta} = \frac{a}{1.22\lambda}$
6. What is maximum number of lines of a grating which will resolve the third order spectrum of two lines having wavelength 5890\AA and 5896\AA .
 - a. 327
 - b. 325
 - c. 322
 - d. 329
7. Polarization cannot takes place in
 - a. Light waves
 - b. X-rays
 - c. radio waves
 - d. sound waves
8. The plane of polarization is at _____ to the plane of vibration
 - a. 45°
 - b. 90°
 - c. 60°
 - d. 180°
9. If there are 4000 lines/ cm on the grating surface, then grating element is
 - a. $2 \times 10^{-5}m$
 - b. 2.5×10^4m
 - c. 2×10^6m
 - d. 0.25×10^7m
10. In an interference due to transmitted light the condition for brightness are
 - a. $2\mu t \cos r = n\lambda$
 - b. $2\mu t \cos r s \frac{(2n+\frac{1}{2})\lambda}{2}$
 - c. both (a) & (b)
 - d. none of the above

Total No. of Printed Pages:2

SUBJECT CODE NO:- L-2157
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc S.Y. (Sem-IV) Examination Oct/Nov 2018
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) Describe the construction, working and characteristics of semiconductor diode. 10

b) Draw a circuit diagram of Hartley oscillator and explain its construction. 10

OR

a) What are the ideal features of an op-amp? Explain op-amp as an adder. 10

b) Explain amplitude modulation in detail along with the waveforms. 10

Q.2 a) Write a note on MOSFET. 05

b) Write a short note on transistor biasing. 05

c) A modulated carrier wave has maximum and minimum amplitudes of 750mV and 250 mV. Calculate the value of percentage modulation. 05

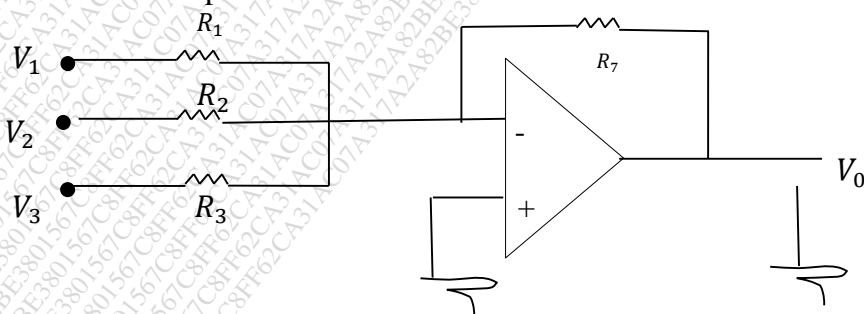
d) Calculate the frequency of oscillation of a phase shift oscillator if $R = 10k\Omega$ and $c = 0.01\mu F$ 05**OR**a) A transistor is connected in a CE configuration. The collector supply voltage is 10v and the voltage drop across the 500Ω connected in the collector circuit is $0.6v$ if $\alpha = 0.96$. find the 05

a) Collector emitter voltage

b) Base current and

c) The emitter current

b) Calculate the output of the circuit 05



$$\begin{aligned} V_1 &= 2v & R_1 &= 10K\Omega \\ V_2 &= 2.5v & R_2 &= 75K\Omega \\ V_3 &= 3v & R_3 &= 100K\Omega \\ V_0 &=? & R_7 &= 100K\Omega \end{aligned}$$

c) Write a note on bistable multi vibrator

05

d) Why there is need of modulation?

05

Q.3 Multiple choice questions

10

1) A carries frequency of 100 kHz is used in amplitude modulation with modulating frequency of 5khz. the bandwidth of AM is ----- kHz

- a) 5 b) 200 c) 10 d) 20

2) The process of regaining the audio signal from the modulated wave is

- a) Modulation b) Amplification c) Demodulation d) rectification

3) The main purpose of modulation is to

- a) produce sidebands b) combine two wave of different frequencies
c) achieve wave shaping of the carrier wave d) transmit low frequency information over long distances

4) theoretically the gain of an op-amp is

- a) zero b) infinite c) 10 d) 100

5) A transistor works efficiently when its emitter base junction is ----- and base collector junction is -----

- a) Forward biased, forward biased b) Reverse biased, forward biased
c) Forward biased, reverse biased d) Reverse biased, reverse biased

6) The voltage gain of an amplifier is defined as

- a) $\frac{V_o}{v_i}$ b) $\frac{V_i}{v_o}$ c) $v_o \times v_i$ d) V_o^2

7) What is an angle of phase shift for each designed RC network in phase shift oscillator circuit?

- a) 30° b) 60° c) 90° d) 180°

8) The dimension of hie parameters are

- a) Mho b) Ohm c) Farad d) None of these

9) A JEET is similar in operation to ----- value

- a) Diode b) Pentode c) Triode d) Tetrode

10) Most of the majority carrier from the emitter

- a) Recombine in the base b) Recombine in the emitter
c) Pass through the base region to the collector d) None of these.

Total No. of Printed Pages:2

SUBJECT CODE NO:- L-2158
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc S.Y. (Sem-IV) Examination Oct/Nov 2018
Physics Paper- XII
Solid State Physics

[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 logarithmic table and electronic pocket calculator is allowed.

- Q.1 a) What is symmetry operation? Explain translation and rotational symmetry operation. 10
- b) Derive density of modes in three dimensions. 10
- OR**
- a) Explain in detail kronig -penny model. 10
- b) What is electrical conductivity? Derive an equation for electrical conductivity. 10
- Q.2 a) Write a note on body center cubic structure. 05
- b) Write short note on bond formation in metals. 05
- c) Calculate specific heat for carbon at $21^\circ K$ if the maximum frequency of lattice vibration for carbon is $4 \times 10^{13} Hz$ ($h = 6.62 \times 10^{-34} j.s$, $k = 1.38 \times 10^{-23} J/k$, $R = 1.986 cal/mole k$) 05
- d) The density of the specimen sample was $8.15 \times 10^{20} M^3$, determine the hall coefficient of the specimen sample. 05
- OR**
- a) What is Fermi energy level? Give significance of Fermi energy level. 05
- b) Write a note on van der waals type of bond. 05
- c) For a cubic crystal, find the miller indices for a plane parallel to y-axis and making intercept of $3a$ to x-axis and $2a$ for Z -axis 05
- d) The debye temperature of sodium is $150K$, then calculate maximum frequency involved in lattice vibration of sodium and also calculate the specific heat of sodium at $2000^\circ k$ 05

Q.3 Attempt all questions.

- 1) Fermi level is defined as-----
 - a) Lowest filled level at 0 k
 - b) lowest filled level at 300°K
 - c) highest filled level at 0 k
 - d) highest filled level at 300°K
- 2) The equation of thermal conductivity of a metal is given by-----
 - a) $k = nv\lambda k$
 - b) $k = \frac{1}{2}nv\lambda k$
 - c) $k = \frac{1}{3}nv\lambda k$
 - d) $k = \frac{1}{4}nv\lambda k$
- 3) Sharing of valence electron in a type of ----- bonding
 - a) Ionic
 - b) covalent
 - c) Van-der-waals
 - d) hydrogen.
- 4) Van der waals force is----- range force.
 - a) Short
 - b) long
 - c) weak
 - d) none of these
- 5) The coordination number of simple cubic structure is-----
 - a) 4
 - b) 6
 - c) 8
 - d) 2
- 6) Packing fraction for BCC structure is -----
 - a) 0.68
 - b) 0.74
 - c) 0.52
 - d) 0.59
- 7) At very low temperature the specific heat is proportional to -----
 - a) T^2
 - b) $3R$
 - c) T^3
 - d) T
- 8) The average energy of harmonic oscillator having frequencies in the range ν to $\nu + d\nu$ is
 - a) $\frac{h\nu}{(e^{h\nu/kT} + 1)}$
 - b) $\frac{h\nu}{(e^{h\nu/kT} - 1)}$
 - c) $\frac{h\nu}{e^{1-h\nu/kT}}$
 - d) $\frac{h\nu}{e^{1+h\nu/kT}}$
- 9) Let V_H be the potential difference between two faces and 'd' is thickness hall voltage is-----
 - a) $V_H = vd^2B$
 - b) $V_H = vd^2B^2$
 - c) $U_H = vdB^2$
 - d) $V_H = v_d d \cdot B$
- 10) The strongest bond is-----
 - a) Ionic bond
 - b) Tetrahedral bond
 - c) covalent bond
 - d) Metallic bond