Total No. of Printed Pages:3

SUBJECT CODE NO:- Y-2178
FACULTY OF SCIENCE
B.Sc. F.Y (Sem- I) Examination March/April 2017
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 question
2) Use of logarithmic table and electronic pocket calculator is allowed .

Q.1 a) Derive the general equation of rectilinear flow of Heat along a bar? 10

b) Derive critical constant. Derive an expressions for the constant of van-der walls equation? 10

OR

a) Derive an expression for adiabatic equation of a perfect gas in terms of Temperature and volume? 10

b) Using Maxwell's relation. Derive Clausius Claperyon latent heat equation and explain the effect of pressure on boiling point of liquid and melting point of solid? 10

Q.2 a) Write a short note on transfer of Heat? 05

b) Calculate the heat passing per hour through the walls of a room 5×5 m .If the walls are of bricks of thickness 30cm the temperature of the room is 30^0 below that of the outride and thermal conductivity of bricks is 12×10^{-4}C.G.S units. 05

c) Write a short note on adiabatic process? 05

d) Find the efficiency of Carnot's engine working between 127^0c & 27^0c. 05

OR

a) Write a short note on sphere of influence? 05

b) Calculate mean free path of nitrogen molecule at 27^0c temperature and one atmospheric pressure. The molecular diameter of nitrogen is 3.5×10^{-8} cm. 05

c) Prove that $\left(\frac{\partial s}{\partial v}\right)_T = \left(\frac{\partial p}{\partial T}\right)_v$ 05

d) Calculate the depression of melting point of ice produced by 1 atm increases by pressure .Given that latent heat of ice=80 cal/gm , specific volume of the ice & water at 0^0c are 1.091 cm^3 and 1 cm^3 05

Q.3 Multiple choice question 10

1) Heat transmitted through a substance with actual migration of particles -------
   a) Convection
   b) Condition
   c) Radiation
   d) All of these
2) Out of the following which has the highest thermal conductivity at the same temperature ----
   a) Helium
   b) Oxygen
   c) Carbon dioxide
   d) Hydrogen
3) Viscosity of gas is due to transport of -----

a) Mass
b) Momentum
c) Energy
d) None of these

4) Thermal conductivity is independent on

a) Volume
b) Pressure
c) Temperature
d) Density

5) An engine works between the temperature 30^0k and 300^0k what is efficiency ----
   a) 50%
   b) 47%
   c) 90%
   d) 10%
6) PV = constant
   a) Adiabatic process
   b) Isochoric process
   c) Isobaric process
   d) Isothermal process
7) The Clausius clapeyron equation is ------

a) $\frac{dp}{dT} = T_L (V_2 - V_1)$

B) $\frac{dT}{dp} = \frac{L}{L\ (v_2 - v_1)}$

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

d) $\frac{dp}{dT} = \frac{L}{L(V_2 - V_1)}$

8) Maxwell's first thermodynamical relation is -----

a) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_p$

B) $\left(\frac{\partial S}{\partial y}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_p$

C) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$

D) $\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V = 0$

9) The critical constant of temperature (Tc) is ------

a) $\frac{a}{27R_b}$

b) $\frac{8_{ab}}{27R}$

c) $\frac{27R_b}{8_a}$

d) $\frac{8_a}{27R_b}$

10) The molecular density in a gas is 'n' and the diameter of its molecule is 'd' then the mean free path of molecule is

a) $\frac{1}{3\sqrt{2}\pi nd^3}$

b) $\frac{1}{\pi nd}$

c) $\frac{\pi}{nd^2}$

d) $\frac{1}{\sqrt{2}\ \pi nd^2}$

Total No. of Printed Pages:2

SUBJECT CODE NO:- Y-2183

FACULTY OF SCIENCE

B.Sc. S.Y (Sem-III) Examination March/April 2017

Physics -VII (Revised)Mathematical Statistical Physics and Relativity

(Revised)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 and electronic pocket calculator is allowed.

Q.1 a) Obtain the solution of homogenous second order differential equation with constant coefficient 10

b) Define and explain the terms Macrostate and microstate with the help of an example 10

OR

a) Derive plank's law of black body radiation 10

b) Derive formula for variation of mass with velocity 10

Q.2 a) Write short note on partial differentiation 05

b) Write short note on Fermi level and Fermi energy 05

c) If $F = 2x^3y + 3x^2y^2$ then find the value of F_{xx} and F_{yy} 05

d) What is thermodynamic probability of the macrostate (3,2), if five bosons are distributed in two compartments, first having 3 cells and second having 4 cells. 05

OR

a) Write short note on phase space 05

b) State the postulates of the special Theory of Relativity 05

c) Calculate the probability that in tossing a coin 6 times, we get 2 heads and 4 tails 05

d) Calculate the rest mass energy of an electron in joules and in electron volts. 05

Q.3 Multiple choice questions 10

1) The quantity $dF = F_x d_x + F_y d_y$ is called as
   a) Total differential of F
   b) An exact differential of F
   c) Implicit function of F
   d) Explicit function of F
2) The partial differential equation $xy\frac{\partial z}{\partial x} = 5\frac{\partial^2 z}{\partial y^2}$ is classified as
   a) Elliptic
   b) Parabolic
   c) Hyperbolic
   d) None of these
3) Combinations of four distinguishable objects taking three at a time are
   a) Two
   b) Three
   c) Four
   d) Six
4) Statistical methods give greater accuracy when number of observation is

a) Very small
b) Very large
c) Neither very small nor very large
d) None of above

5) Bosons have a spin value
a) Zero
b) One
c) Half
d) Zero or one

6) Which of the following particle is not a fermions
a) Electron
b) Proton
c) π meson
d) $photon$

7) If speed of a particle moving at relativistic speed is doubled , It's linear momentum
a) Becomes double
b) Becomes more than double
c) Remains same
d) Becomes less than double

8) When mass m is converted into energy it release energy equal to
a) mc^3
b) mc^2
c) m^2c
d) mc

9) The degree of the given differential equation $\left(\frac{d^2y}{dx^2}\right)^4 + \left(\frac{dy}{dx}\right)^5 + xy^3 + xy^2 = 0$
a) 4
b) 5
c) 3
d) 2

10) Spin of fermions is
a) 1
b) 0
c) ½
d) 0 or 1

Total No. of Printed Pages:2

SUBJECT CODE NO:- Y-2025
FACULTY OF SCIENCE
B.Sc. S.Y (Sem-IV) Examination March/April 2017
Physics Paper-XI (General Electronics) (Revised)

[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) Describe in detail input and output characteristics of common base transistor. 10
(b) Derive an expression for voltage gain of an operational amplifier connected in an inverting mode 10

OR

(a) Explain in detail principle and working of phase shift oscillator 10
(b) Define modulation. Derive an expression for an amplitude modulated wave 10

Q.2 (a) Write a short note in PNP transistor 05
(b) If In=6mA, V_{Gs}(off) = -7v and V_{GS} = -5v for a JFET then find the value of I_{Dss}. 05
(c) Write a note on hybrid parameters for a circuit 05
(d) Calculate time period and frequency of a square wave from an astable multi vibrator if resistances of 20K Ωor and capacitors of 0.01 μf are connected in the circuit 05

OR

(a)Discuss noise in an amplifiers 05
(b) Determine output voltage for an op-amp as an adder if R_1=R_2=R_f=20KΩ or and V_1=V_2 = 5V 05
(c) Explain modulation index 05
(d) If the carrier frequency in an FM modulator is 1020 KHz and its modulating frequency is 20 KHz then calculate the upper and lower side band frequency 05

Q.3 Multiple choice questions (Attempt all) :- 10

(1) The reverse current in a semiconductor diode is of the order of -
(a) Ampere (b) milli ampere (c) micro ampere (d) zero

(2) The input control parameters of a JFET is __
(a) gate current (b) drain current
(c) drain voltage (d) gate voltage

(3) An operating point for a transistor circuit is also called as ___
(a) Saturation point (b) cut off point
(c) control point (d) Quiescent point

(4) In amplifiers, RC Coupling is used for __ amplification
(a) Current (b) Voltage (c) Power
(d) All of the above

(5) If an output of an amplifier is 20V and 100 mv from the output is again feedback to the input then the feedback fraction will be __
(a) 0.005 (b) 0.05 (c) 0.5 (d) 5

2017

(6) An oscillator produces _____
(a) damped oscillations (b) undamped oscillations (c) modulated waveforms
(d) demodulated waveforms

(7) The frequency of oscillations in Hartley oscillators is ___
(a) $\frac{1}{2\pi\sqrt{Lc}}$ (b) $\frac{2\pi}{\sqrt{Lc}}$ (c) $\frac{\sqrt{Lc}}{2\pi}$ (d) $\frac{1}{2\pi\, Lc}$

(8) The bistable multivibrator has __
(a) no stable state (b) One stable State
(c) two stable state (d) All of the above

(9) The frequency deviation of a frequency modulated wave is 30 KHz with modulating frequency as 10 KHz then its modulation index will be __
(a) 0.33 (b) 300 (c) 3 (d) 0.033

(10) In an amplitude modulation, the maximum power is in __
(a) upper side bands (b) Lower side bands
(c) Carrier (d) frequency

Total No. of Printed Pages:2

SUBJECT CODE NO:- Y-2027
FACULTY OF SCIENCE
B.Sc. S.Y (Sem-IV) Examination March/April 2017
Physics Paper- XII
Solid State Physics (Revised)

[Time:1:30Hours] **[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) Obtain expression for interplannar spacing in cubic crystals. 10
b) Discuss Brillouin zone in one and two dimensions. 10

OR

a) Obtain an expression for lattice heat capacity on the basis of Einstein's theory. 10
b) Obtain an expression for electrical conductivity of metals. 10

Q.2 a) Write a short note on 'bcc' structure. 05
b) Calculate co-ordinates of plane (1 2 3) 05
c) Give assumptions of classical theory of heat capacity of solids. 05
d) Energy of harmonic oscillator is 7.5 ev. calculate its vibration per unit time . 05
[Given : 1ev = 1.6×10^{-19} J , h=6.63×10^{-34} J-s]

OR

a) Give characteristics of ionic bonds. 05
b) Potential energy of a diatomic molecule is given by 05

$U_{(R)} = -\frac{A}{R^2} + \frac{A}{R^{10}}$ where , 'R' is equilibrium spacing between the atoms. If A = 1.44×10^{-39} Jm^2 and B = 2.19×10^{-115} Jm^2 , calculate the value of R.

c) Write a short note on Fermi energy level. 05
d) Electron density of certain specimen is 2.55×10^{28} per cubic meter. Calculate Hall coefficient for it. 05
[Given : e = 1.6×10^{-19} C].

Q.3 Attempt all. 10

1) Total number of lattice point per unit primitive unit cell is ----------
a) 8 b) 1/8 c) 2 d) 1
2) Total number of distinct crystal systems is ----------
a) 7 b) 14 c) (7/14) d) None of these.
3) Formation of ionic bond take place by ----------
a) Sharing of electrons.
b) Transfer of electrons.
c) Pairing of electrons.
d) Both (a) and (b).
4) Oxygen molecule possesses ----------
a) Ionic bond b) Covalent bond c)vander waal's bond d) None of these.

5) According to Dulong and Petit's law, the lattice heat capacity of different solids is ----------
   a) Temperature independence
   b) Frequency independent
   c) Both (a) and (b)
   d) None of (a) and (b).
6) According to Debye's theory , at very low temperatures, the lattice heat capacity of solids is proportional to ---------- of absolute temperature.
   a) Sequence b) cube c) Square root d) cube root.
7) According to Wiedemann and Franz law , The ratio of thermal conductivity to electrical conductivity of metals is ----------.
   a) Constant at given temperature
   b) Independent of metals
   c) Proportional to absolute temperature
   d) All of these.
8) The Hall coefficient for negative carrier is given by, ----------
   a) $R_H = -\frac{1}{ne}$ b) $R_H = ne$ c) $R_H = -\frac{1}{n^2 e}$ d) $R_H = -\frac{n^2}{e}$
9) Structure of sodium chloride is ----------
   a) fcc b) bcc c) sc d) none of these .
10) Which one of the following is weakest?
   a) Ionic bonding b) covalent bonding c) Vander Waal's bonding d) metallic bonding.

Total No. of Printed Pages:2

SUBJECT CODE NO:- Y-2027
FACULTY OF SCIENCE
B.Sc. S.Y (Sem-IV) Examination March/April 2017
Physics Paper- XII
Solid State Physics (Revised)

[Time:1:30Hours] **[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) Obtain expression for interplannar spacing in cubic crystals. 10
b) Discuss Brillouin zone in one and two dimensions. 10

OR

a) Obtain an expression for lattice heat capacity on the basis of Einstein's theory. 10
b) Obtain an expression for electrical conductivity of metals. 10

Q.2 a) Write a short note on 'bcc' structure. 05
b) Calculate co-ordinates of plane (1 2 3) 05
c) Give assumptions of classical theory of heat capacity of solids. 05
d) Energy of harmonic oscillator is 7.5 ev. calculate its vibration per unit time . 05
[Given : 1ev = 1.6×10^{-19} J , h=6.63×10^{-34} J-s]

OR

a) Give characteristics of ionic bonds. 05
b) Potential energy of a diatomic molecule is given by 05

$$U_{(R)} = -\frac{A}{R^2} + \frac{A}{R^{10}}$$

where , 'R' is equilibrium spacing between the atoms. If A = 1.44×10^{-39} Jm^2 and B = 2.19×10^{-115} Jm^2 , calculate the value of R.

c) Write a short note on Fermi energy level. 05
d) Electron density of certain specimen is 2.55×10^{28} per cubic meter. Calculate Hall coefficient for it. 05
[Given : e = 1.6×10^{-19} C].

Q.3 Attempt all. 10

1) Total number of lattice point per unit primitive unit cell is ----------
a) 8 b) 1/8 c) 2 d) 1
2) Total number of distinct crystal systems is ----------
a) 7 b) 14 c) (7/14) d) None of these.
3) Formation of ionic bond take place by ----------
a) Sharing of electrons.
b) Transfer of electrons.
c) Pairing of electrons.
d) Both (a) and (b).
4) Oxygen molecule possesses ----------
a) Ionic bond b) Covalent bond c)vander waal's bond d) None of these.

5) According to Dulong and Petit's law, the lattice heat capacity of different solids is ----------
   a) Temperature independence
   b) Frequency independent
   c) Both (a) and (b)
   d) None of (a) and (b).
6) According to Debye's theory , at very low temperatures, the lattice heat capacity of solids is proportional to ---------- of absolute temperature.
   a) Sequence b) cube c) Square root d) cube root.
7) According to Wiedemann and Franz law , The ratio of thermal conductivity to electrical conductivity of metals is ----------.
   a) Constant at given temperature
   b) Independent of metals
   c) Proportional to absolute temperature
   d) All of these.
8) The Hall coefficient for negative carrier is given by, ----------
   a) $R_H = -\frac{1}{ne}$ b) $R_H = ne$ c) $R_H = -\frac{1}{n^2 e}$ d) $R_H = -\frac{n^2}{e}$
9) Structure of sodium chloride is ----------
   a) fcc b) bcc c) sc d) none of these .
10) Which one of the following is weakest?
   a) Ionic bonding b) covalent bonding c) Vander Waal's bonding d) metallic bonding.

Total No. of Printed Pages:2

SUBJECT CODE NO:- Y-2185
FACULTY OF SCIENCE
B.Sc. S.Y (Sem-III) Examination March/April 2017
Physics -VIII (Revised) 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) Discuss Lenard's method to determine e/m for photoelectrons. 10
b) Describe the powder crystal method of studying crystal structure. 10

OR

a) Describe liquid droop model of nucleus. Explain various terms in semi – empirical mass formula. 10
b) Discuss the construction and working of cyclotron. 10

Q.2 a) Write a short note on photomultiplier. 05
b) Write a short note on atom bomb. 05
c) Calculate the work function of sodium, in electron-volts, given that the threshold wavelength is 6800 A^0 and h = 6.625 X 10^{-34}Js. 05
d) Calculate the energy released by the fission of 3gm of $_{92}U^{235}$ in joule if energy released per fission is 200 M_eV. 05

OR

a) Write a short note on the Laue method. 05
b) Write a short note on synchrocyclotron. 05
c) The distance d between two adjacent atomic planes in a calcite is 3.04 A^0. Find the wavelength for which the first order reflection occurs at 14.7^0. 05
d) A cyclotron in which the flux density is 0.7 tesla is employed to accelerate deuterons. What is the frequency of oscillating field? (mass of deuteron = 3.3 X 10^{-27}kg, charge = 1.6 X 10^{-19}c). 05

Q.3 Multiple choice questions. 10

1) The maximum kinetic energy of the photoelectrons increases with
   a) Zero freq of light.
   b) Decreasing freq of light.
   c) Increasing freq of light.
   d) None of these.
2) No external battery is required to operate _____ as the cell itself generates an emf
   a) Photo-emissive cell
   b) Photo voltaic cell
   c) Photo conductive cell
   d) Dry cell

2017

3) In Richardson and Compton photo tube, inner silver coating of spherical surface acts as
   a) Cathode
   b) Anode
   c) Dynode
   d) Triode
4) X-rays were discovered by _____ in 1895.
   a) Compton
   b) Richardson
   c) Roentgen
   d) Laue
5) In Coolidge tube the target is made of a metal like tungsten having _____ melting point.
   a) High
   b) Low
   c) Very low
   d) None of these
6) The frequency of x-rays emitted depends on the _____ between the cathode
   a) Voltage
   b) Velocity
   c) Wavelength
   d) Intensity
7) Which of the following is not the magic number?
   a) 8
   b) 25
   c) 50
   d) 82
8) Binding energy of a nucleon in nucleus is of the order of a few.
   a) Electron volt
   b) Ergs
   c) Joule-sec
   d) Million electron volt
9) A cyclotron uses two dees while there is only _____ dee in a synchrocyclotron.
   a) One
   b) Two
   c) Three
   d) four
10) The Betatron is a particle accelerator capable of producing high energy _____.
   a) Proton
   b) Neutron
   c) Dutron
   d) electron

Total No. of Printed Pages:2

SUBJECT CODE NO:- Y-2003
FACULTY OF SCIENCE
B.Sc. T.Y (Sem-VI) Examination March/April 2017
Physics Paper-XIX (Revised)
(Atomic, Molecular Physics & Laser)

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

Please check whether you have got the right question paper.

N.B
i) Solve all questions.
ii) Draw the neat diagram wherever necessary.

Q.1 a) Explain Rutherford atomic model and give its drawbacks. 10
b) Explain the different quantum numbers associated with vector atomic model. 10

OR

a) Give the theory of Raman Effect and describe the experimental arrangement. 10
b) Describe construction and working of Rube laser. 10

Q.2 a) i) Give the diagrammatic representation series spectrum of it atom. 05
ii) Wavelength first line Lyman series is 912 A^0. Find the wavelength of first line paschen series. 05

b) i) How Raman Effect is used to determine the nature of liquid. 05
ii) The force constant of the bond in Co molecule is 1956 N/m. calculate the frequency of vibration of molecule. (Given Reduced mass of Co is $1.16 \times 10^{-26} kg$) 05

OR

a) i) Explain the L-S coupling. 05
ii) Calculate angular momentum of 'f' electron. 05

b) i) Explain population inversion conditions for laser. 05
ii) Give the construction of carbon dioxide for laser. 05

Q.3 Choose the correct answer. 10

1) The atom has tiny positively charged core called ----------.
a) Nucleus b) Proton c) Neutron d) Electron
2) In the Rutherford experiment to determine the structure of atom of scattering of ---------- particle by thin sheet of matter is used.
a) β b) γ c) α d) None of these
3) The value of spin quantum of an electron in hydrogen atom is ----------.
a) $\pm\frac{1}{2}$ b) ± 1 c) $\pm\frac{3}{2}$ d) 0
4) All the three vectors L, S and J are ---------.
a) Parallel b) Perpendicular c) Anti-parallel d) Quantized

2017

5) The molecular spectra arise due to transition between allowed ---------- states of molecules.
   a) Power b) Energy c) Velocity d) Momentum
6) Raman lines are strongly ----------
   a) Polarized b) Unpolarized c) Diffraction d) Interference
7) Principle of LASER is ----------.
   a) Spontaneous absorption b) Stimulated emission c) Induced emission
   d) Both a and b
8) In stimulated emission processes the numbers of coherent photon are --------.
   a) 2 b) 1 c) 3 d) 4
9) Determine the value of 'J' for L=2 and S=3/2.
   a) 7/2 b) 5/2 c) 3/2 d) ½
10) LASER source is highly ----------
   a) Coherent b) Inense c) Directional d) All of these

Total No. of Printed Pages:2

SUBJECT CODE NO:- Y-2005
FACULTY OF SCIENCE
B.Sc. T.Y (Sem-VI) Examination March/April 2017
Physics Paper-XX (Revised)
(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
i) Solve all questions.
ii) Draw the neat diagram wherever necessary.

Q.1 a) Describe fixed dome type biogas plant in detail with neat diagram. 10
b) Describe solar PV cell with neat diagram. Give the merits and limitations of solar PV system. 10

OR

a) Discuss the high purity silica fibers used in UV and IR region. 10
b) Explain outer chemical vapour deposition in brief with its characteristic. 10

Q.2 a) i) Write a short note on solar energy. 05
ii) Write a short note on Biomass. 05

b) i) Give the importance of optical fiber. 05
ii) A stepped fiber has core diameter 300μm and NA=0.29, calculate number of propagating mode at an operating wavelength of 800nm. 05

OR

a) i) Write a note on Lead-acid battery. 05
ii) The solar cell gives 3.5A, short circuit current and 0.6V open circuit voltage. What is the maximum power of solar cell? 05

b) i) Write a short note on optical fiber cable lying in telephone. 05
ii) Calculate strain on fiber from the given data. Cladding radius of fiber 1.25μm it bends along the curve of radius of 5 cm. 05

Q.3 Choose the correct answer. 10

1) The wind turbine generater units convert wind power into ----------.
a) electrical power b) electrical current c) electrical energy d) electrical heat
2) Biomass is considered as --------- source of energy.
a) renewable b) nonrenewable c) both of them d) none of the above
3) Solar photo voltaic cells are semi conductor devices and mostly used.
a) aluminium b) silicon c) cadmium d) carbon

4) A battery converts ---------- energy into electrical energy.
   a) light b) chemical c) thermal d) sound
5) Optical fibers are good --------
   a) dielectrics b) conductors c) insulators d) both a and b
6) Source of light for optical fiber is
   a) PN diode b) photo diode c) LED d) none of them
7) For fabrication of highly pure optical fibers, which one of the following technique is preferred?
   a) external CVD b) internal CVD c) AVD d) none of these
8) In fabrication of optical fiber silica is used because
   a) it is cheap and easily available
   b) it is found in abundance
   c) it is obtained in purest form
   d) none of these
9) The gas obtained from biomass is
   a) methane b) ethane c) oxygen d) organ
10) Increase in concentration of GeO_2 in Sio_2 of solar cell will
   a) decrease the refractive index
   a) increase the refractive index
   c) change the refractive index normally
   d) not change refractive index at all

SUBJECT CODE NO:- Y-2063
FACULTY OF SCIENCE
B.Sc. T.Y (Sem-V) Examination March/April 2017
Physics Paper- XVI
(Electrodynamics) (Reviesd)

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

Please check whether you have got the right question paper.

N.B i) Attempt all questions.
ii) All questions carry equal marks.

Q.1 a) State and prove Gauss law in electrostatics. 10
b) Derive the Maxwell's equation, 10

$$div\ \vec{D} = \boldsymbol{\varrho}\ ;\ \text{curl}\ \vec{\text{E}} = \frac{-\partial \vec{\text{B}}}{\partial \text{t}}$$

OR

a) State the characteristics of electromagnetic waves in free space. 10
b) Determine the boundary condition at interface for $\vec{E}$. 10

Q.2 a) Explain the concept of Gaussian pill box. 05
b) The electric flux from the charge is 8×10^5. If $\epsilon_0 = 8.85 \times 10^{-12}\ N/m^2$, then find the value of charge. 05
c) Define poynting vector? What does it represent? Give its SI unit. 05

d) Calculate the value of poynting vector on the surface of the sun if the power radiated by it is $3.8 \times 10^{26} watt$ (radius of the sun=$7 \times 10^8 m$). if the average distance between the sun and the earth is $1.5 \times 10^{11} m$, show that the value of solar constant is $1.34 \times 10^3\ watt/m^3$. 05

OR

a) Write a short note on self induction. 05
b) A current is changing at the rate of 4 A/S in the coil , induces an emf of 5V in the neighboring coil. Calculate the coefficient of mutual inductance between the coil. 05
c) Derive the boundary condition for the electric displacement $\vec{D}$. 05
d) If the refractive indices of the two media are 1.2 and 1.5, angle of incidence is 45°, then find the angle of transmission. 05

Q.3 Multiple choice questions. 10

1) The lines of force between two charged particles are .....
   a) Always straight
   b) Always curved
   c) Sometimes curved
   d) None of these.

2) S.I. unit of electric flux is .....
   a) $\frac{NM^2}{C}$
   b) $\frac{NC}{m^2}$
   c) $\frac{Nm}{C^2}$
   d) None of the above.

3) Gaussian pill box extending equal distance .....
    a) Below the plane
    b) Above the plane
    c) Above and below the plane
    d) All above.
4) Displacement current density $\vec{J}$ depends upon .....
    a) $\vec{D}$
    b) $\vec{E}$
    c) $\vec{B}$
    d) $\vec{F}$.
5) Magnitude of induced emf is proportional to
    a) Rate of change of current
    b) Rate of change of magnetic flux linked
    c) Rate of change of voltage
    d) None of the above.
6) The direction of induced emf can be found .....
    a) Laplace law
    b) Ohm's law
    c) Faraday's law
    d) Lenz's law.
7) A changing electric field gives rise to .....
    a) Magnetic field
    b) Sound field
    c) Electromagnetic field
    d) Near and far field.
8) Reflection, Refraction, Transmission and absorption of electromagnetic wave depends upon .....
    a) Surface and medium
    b) Nature of surface and frequency
    c) Medium and frequency
    d) None of these.
9) The tangential component of electric field $\vec{E}$ is ..... across the interface.
    a) Discontinuous
    b) Continuous
    c) Both
    d) Both a & b.
10) The incident, reflected, refracted waves all lie in the same plane but ..... to the boundary surface.
    a) Normal
    b) Polarization
    c) Same
    d) Different.

SUBJECT CODE NO:- Y-2061
FACULTY OF SCIENCE
B.Sc. T.Y (Sem-V) Examination March/April 2017
Physics Paper-XV (Reviesd)
(Classical & Quantum Mechanics)

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

Please check whether you have got the right question paper.

N.B i) All questions are compulsory.
ii) All questions carry equal marks.

Given Data :

$K = 1.38 \times 10^{-23} J/k$ $h = 6.63 \times 10^{-34} Js$

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

$\mu_0 = 4\pi \times 10^{-7}\ Wb/Amp$ $e = 1.6 \times 10^{-19} C$

$C = 3 \times 10^{8} m/s$ $1eV = 1.6 \times 10^{-19} J$

Q.1 a) Using Lagrange's equation, obtain equation of motion for simple pendulum and linear harmonic oscillator. 10

b) What is black body? Discuss the failure of classical physics to explain black body radiation. 10

OR

a) Discuss de-Broglie's hypothesis of matter wave. Show that group velocity equal to particle velocity. 10

b) Obtain position dependent wave function and derive the steady state form of Schrodinger's wave equation. 10

Q.2 a) Explain D'Alembert's principle. 05

b) A spring of mass M and spring constant K, is hung vertically. Another mass M is suspended from it. Write down the Lagrangian of the system and show that system will execute S.H.M of period 05

$$2\pi\sqrt{\frac{\left(\frac{M}{3}\right)+M}{K}}$$

c) Apply Heisenberg's uncertainty principle to explain binding energy of an electron in an atom. 05

d) An electron have wavelength of $2A°$. What is their momentum and total energy? 05

OR

a) Discuss linear momentum of photon in terms of wave vector. 05

b) The threshold frequency of photo-electronic emission in copper is $1.1 \times 10^{15} Hz$.Find the maximum energy in eV. When light of frequency $1.2 \times 10^{15} Hz$ is directed on the copper surface. 05

c) Explain various operators used in quantum mechanics. 05

d) Calculate the energy difference between the ground state and the first excited state for an electron in a dimensional rigid box of length $1.2A°$. 05

Q.3 Multiple choice questions. 10

1) $\frac{d}{dt}\left(\frac{\partial L}{\partial \dot{q_k}}\right) - \frac{\partial L}{\partial q_k} = 0$ represents Lagrangain's equation for
   a) General system
   b) Conservative system
   c) Linear system
   d) None of these.

2) If torque is not acting on the particle then its angular momentum is .....
   a) Constant
   b) Zero
   c) Variable
   d) None of these.

3) In photo electric emission the number proportional to .....
   a) I
   b) λ
   c) ϑ
   d) W.

4) In Rayleigh-Jeans formula is agress with the experiment results in the region of .....
   a) Shorter wavelength
   b) Between shorter and longer wavelength
   c) Longer wavelength
   d) Both (a) and (b).

5) A perfectly black body absorbs all the radiations of ..... which fall on it.
   a) All wavelengths
   b) Shorter wavelengths
   c) Longer wavelengths
   d) None of these.

6) The de-Broglie wavelength of an atom at absolute temperature $T°k$ will be .....
   a) $\frac{h}{mkT}$
   b) $\frac{h}{\sqrt{3mkT}}$
   c) $\frac{\sqrt{3mkT}}{h}$
   d) $\sqrt{3mkT}$.

7) Which phenomenon best supports the theory that matter has a wave nature.
   a) Electron momentum
   b) Electron differentiation
   c) Photon momentum
   d) Photon differentiation.

8) The uncertainty in locating electron is $\perp A°$ then uncertainty in measurement of momentum .....
   a) $5.2 \times 10^{-25} Kgms^{-1}$
   b) $8.2 \times 10^{-25} Kgms^{-1}$
   c) $1.5 \times 10^{-19} Kgms^{-1}$
   d) $2.8 \times 10^{-19} Kgms^{-1}$.

9) Which of the following wave function represent a free particle moving along +ve x-axis.
   a) $A\sin(kx - wt)$
   b) $A\cos(kx - wt)$
   c) $Ae^{i(kx-wt)}$
   d) $Ae^{-i(kx-wt)}$.

10) The total probability of finding the particle in the entire space is represented by ..... equation.
   a) $\int_{-\infty}^{+\infty} |\varphi|^2 \, dv = 0$
   b) $\int_{-\infty}^{+\infty} |\varphi|^2 \, dv = \infty$
   c) $\int_{-\infty}^{+\infty} |\varphi|^2 dv = 1$
   d) None of the above.