


VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2016

Part – III : Core Subject : Second Semester : Paper – I

THERMODYNAMICS AND STATISTICAL MECHANICS

Under CBCS – Credit 4

 Time: **3** Hours

 Max. Marks: **75**
SECTION – A
Answer ALL Questions :
(10 × 1 = 10)

- The thermal conductivity of bad conductor is measured by _____.
 a) Searles method b) Lee's disc method
 c) Callendar method d) None of these
- The value of critical volume V_c according to vander waals gas equation is _____.
 a) b b) $3b$ c) $2b$ d) $4b$
- An adiabatic process occurs at constant _____.
 a) temperature b) pressure c) heat d) None of the above
- The particles obeying Maxwell – Boltzmann statistics are _____.
 a) identical b) identical and distinguishable
 c) distinguishable d) Photons
- According to which statistics, the energy at absolute zero cannot be zero.
 a) M – B b) B – E c) F – D d) None of the above
- _____ is the source of radiations emits heat radiations in all directions.
- The effective temperature of the sun is _____.
- If a system undergoes a change in which the pressure is kept constant, the process is called _____.
- If the number of collision is N , total path travelled in these collisions is S , then mean free path λ is _____.
- Phase space is _____ dimensional space.

SECTION – B
Answer ALL Questions :
(5 × 7 = 35)

- a) Deduce Newton's law of cooling from Stefan's law.
 (OR)
 b) Calculate the radiant emittance of black body at a temperature of
 i) 500 K and ii) 5000 K
- a) Describe Linde's process of liquefaction of air.
 (OR)
 b) The Vander Waals constants a and b for 1 gram molecule of hydrogen are $a = 0.245\text{ atm}\cdot\text{litre}^2\cdot\text{mole}^{-2}$
 $b = 2.67 \times 10^{-2}\text{ litre}\cdot\text{mole}^{-1}$. Calculate critical temperature.
- a) Write short notes on i) isothermal process and
 ii) isochoric process
 (OR)
 b) Calculate the workdone when a gram molecule of an ideal gas expands isothermally at 27°C to double its original volume given
 $R = 8.3\text{ J/deg mole}$.
- a) Apply Maxwell Boltzmann distribution law to an ideal gas.
 (OR)
 b) Write down probability theorems is statistical thermodynamics.
- a) Compare MB, BE and FD statistics.
 (OR)
 b) Write short notes on photon gas.

SECTION – C
Answer any THREE Questions :
(3 × 10 = 30)

- Discuss Lee's disc method for finding the co-efficient of thermal conductivity for bad conductors.
- Discuss briefly the theory of Porous plug experiment.
- State and prove Carnot's theorem. Show that the temperature below zero Kelvin is not possible.
- Obtain an expression for Maxwell – Boltzmann distribution law.
- Obtain an expression for Fermi – Dirac distribution law.

** ** ** ** **

**ELECTROMAGNETISM**

Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: 75

SECTION – A**Answer ALL Questions :****(10 × 1 = 10)**

- Differential form of Gauss law is _____.
 a) $\nabla \cdot E = \frac{\rho}{\epsilon_0}$ b) $\nabla \times E = \frac{\rho}{\epsilon_0}$ c) $\nabla \cdot E = \frac{\epsilon_0}{\rho}$ d) $\nabla \cdot E = 0$
- The relation between the potential and electric field intensity is expressed by the equation _____.
 a) $E = \frac{\partial v}{\partial x} \hat{i}$ b) $E = -\frac{\partial v}{\partial x} \hat{i}$ c) $E = \nabla V$ d) $E = -\nabla V$
- $J = \sigma E$ is _____.
 a) Maxwell's equation b) Continuity equation
 c) a form of Ohm's law d) Ampere's law
- The S.I. unit of magnetic field is _____.
 a) gauss b) $\frac{wb}{m^2}$ c) coulomb d) henry
- Q factor of a coil is measure of its _____.
 a) Mutual inductance b) self inductance
 c) retentivity d) selectivity
- Two equal and opposite charges separated by a distance called ____.
- Capacitors are used for storing _____ energy.
- _____ is a device used for measuring potential difference.
- Differential form of Ampere's law is given by $\text{curl } B =$ _____.
- Transformers which convert high voltages into lower voltages are called _____ transformers.

SECTION – B

Answer ALL Questions :

(5 × 7 = 35)

11. a) Derive an expression for the electric field at any point due to a electric dipole. i) axial line ii) equatorial line

(OR)

- b) A positive charge of $q_1 = 2 \times 10^{-7} C$ is placed at a distance of $0.15m$ from another positive charge of $q_2 = 8 \times 10^{-7} C$. At what point on the line joining them is the electric field zero?

12. a) Derive an expression for the capacitance of a cylindrical capacitor.

(OR)

- b) A co-axial cable consists of a copper core of $1mm$ radius within an outer metal sheath of $1cm$ radius separated by an insulating material of dielectric constant 5. What is the capacitance per meter length of the cable in pico-farad? How much energy is stored in $10km$ length of this cable when 10,000 volts is applied between the core and the sheath? $\epsilon_0 = 8.85 \times 10^{-12} C^2 N^{-1} m^{-2}$.

13. a) Explain how capacitance of a capacitor can be determined by Kelvin's Null method.

(OR)

- b) A copper wire of diameter $0.5mm$ and length $20m$ is connected across the battery of *emf* $1.5V$ and internal resistance $1.25ohm$. Calculate the current density in the wire and the drift velocity v_d , assuming one conduction electron per atom of copper. What is the heat dissipated per metre of the wire?

Resistivity of copper $= 1.7 \times 10^{-8} \Omega m$.

Density of copper $= 8.89 \times 10^3 \frac{kg}{m^3}$,

Atomic weight of copper $= 63.54 \frac{kg}{mole}$,

Avogadro Number $N_A = 6.025 \times 10^{26} \frac{kg}{mole}$.

14. a) Describe how Ballistic galvanometer can be used to compare the capacitances of two capacitors.

(OR)

- b) A solenoid of 1200 turns is wound uniformly in a single layer on a glass tube $2m$ long and $0.2m$ in diameter. Find the magnetic induction at the centre of the solenoid, when a current of $2A$ flows through it.

15. a) Describe the principle, construction and working of an A.C. dynamo.

(OR)

- b) An alternating voltage of 10 volts at 100Hz is applied to a choke of inductance 5henry and of resistance 200 ohms. Find the power factor of the coil and the power absorbed.

SECTION – C

Answer any THREE Questions :

(3 × 10 = 30)

16. Apply Gauss's law to calculate the electric field intensity due to a uniformly charged non conducting sphere at points

- i) outside the sphere ii) at the surface of the sphere
iii) inside the sphere

17. Derive an expression for the combined capacitance of three capacitors connected in i) series ii) parallel

18. Explain how a Carey Foster bridge is used to determine an unknown resistance.

19. State Biot-Savart law. Using Biot-Savart law, calculate the value of magnetic field due to an infinitely long straight wire carrying a current 'I' ampere at a distance 'a' from the wire.

20. Derive an expression for the resonant frequency of a parallel L.C.R. circuit.

**** ** ***

**SECTION – A****Answer ALL Questions :****(10 × 1 = 10)**

1. The maximum efficiency of a half wave rectifier is _____.
 a) 40.6% b) 81.2% c) 50% d) 25%
2. The operating point is also called as the _____.
 a) Cut-off point b) quiescent point
 c) saturation point d) none of the above
3. The stability factor for a base resistor bias is _____.
 a) $R_b (\beta + 1)$ b) $\beta + 1$ c) $\beta - 1$ d) $1 - \beta$
4. For sustaining oscillations in an oscillator _____.
 a) Feedback factor should be unity
 b) phase shift should be zero° (or) $n\pi$
 c) Phase shift should be negative d) both (a) and (b)
5. In an AM wave the useful power is carried by _____.
 a) carrier b) side bands
 c) both sidebands and carrier d) none of the above
6. A zener diode is always _____ connected.
7. A JFET is a _____ driven device.
8. In an RC coupled amplifier, the voltage gain over mid frequency range is _____.
9. An ideal OP-AMP has _____ band width.
10. In FM carrier _____ remains constant.

SECTION – B

Answer ALL Questions :

(5 × 7 = 35)

11. a) Define the expression for the efficiency of a half wave rectifier.

(OR)

b) A full wave rectifier uses two diodes, the internal resistance of each diode may be assumed constant at 20 ohms. The transformer r.m.s secondary voltage from centre tap to each end of secondary is 50V and load resistance is 980 ohms.

Find: i) the mean load current ii) the r.m.s value of load current.

12. a) Explain the principle & working of JFET.

(OR)

b) In a transistor circuit, collector load is $4k\Omega$ whereas quiescent current (zero signal collector current) is 1mA.

i) What is the operating point if $V_{CC}=10V$?

ii) What will be the operating point if $R_C=5k\Omega$?

13. a) Describe the potential divider method in detail.

(OR)

b) i) A germanium transistor is to be operated at zero signal

$I_C = 1mA$. If the collector supply $V_{CC}=12V$, what is the value of R_B in the base resistor method? Take $\beta=100$.

ii) If another transistor of the same batch with $\beta=50$ is used, what will be the new value of zero signal I_C for the same R_B ?

14. a) With a neat diagram explain the action of Hartley Oscillator.

(OR)

b) Determine the i) operating frequency and ii) feedback fraction for Colpitt's oscillator. $C_1=0.001\mu F$, $C_2=0.01\mu F$ and $L=15\mu H$.

15. a) Explain the function of each stage of superhetrodyne receiver with the help of a block diagram.

(OR)

b) The load current in the transmitting antenna of an unmodulated AM transmitter is 8A. What will be the antenna current when modulation is 40%?

SECTION – C

Answer any THREE Questions :

(3 × 10 = 30)

16. What is a filter circuit? Describe the action of different types of filter circuits.

17. Discuss the performance of transistor amplifier.

18. With a neat circuit diagram, explain the operation and frequency response of a RC coupled transistor amplifier.

19. Explain the operation of op-amp as an adder and subtractor.

20. Explain amplitude modulation. Derive the voltage equation of an amplitude modulated wave.

**** ** ***

**PROGRAMMING IN C**

Under CBCS – Credit 5

Time: **3 Hours**Max. Marks: **75****SECTION – A****Answer ALL Questions :****(10 × 1 = 10)**

- _____ is the special function used by the C system to tell the computer where the program starts.
a) get() b) start() c) main() d) scanf()
- Find the incorrect backspace character constant from the following.
a) \a b) \b c) \d d) \f
- The operator has three operands is called _____.
a) unconditional operator b) conditional operator
c) nested if operator d) switch case operator
- An early exit from an loop can be done by _____ statement.
a) for b) while c) continue d) break
- A _____ is a self contained block of code that performs a particular task.
a) array b) function c) structure d) union
- The value of flag is _____, where, flag = (10 < 5)? 5:10.
- _____ is an unconditional branching statement.
- Maximum of _____ number of elements can be stored in memory for the array declaration int[2][3][2].
- The process of calling a function by using pointers to pass the address of the variables is called as call by _____.
- All the member of a Union use the same _____.

SECTION – B

Answer ALL Questions :

(5 × 7 = 35)

11.a) Write in detail about primary data types available in C.

(OR)

b) Give the basic Structure of a C program with an example.

12.a) Write in detail about the following operators used in C.

1. Arithmetic 2. Relational 3. Logical

(OR)

b) Give the operator precedence rules for evaluating arithmetic expressions. Using the rules find the value of x.

$$x = 2 * \left((i \% 5) * \left(4 + \frac{(j-3)}{(k+2)} \right) \right), \text{ where } i = 8, j = 15 \text{ and } k = 4.$$

13.a) Differentiate while-do statement from do-while statement.

(OR)

b) Discuss the usage of simple if and else-if statements.

14.a) Explain with suitable example, how 2D arrays can be declared and initialized.

(OR)

b) Explain the following categories of functions.

1. Functions with no arguments and no return values.

2. Functions with arguments and return values.

15.a) Explain how structures are declared, initialized and its members are accessed?

(OR)

b) Write about the following.

1. Declaration of pointer variables.

2. Initialization of pointer variables.

3. Accessing a variable through its pointers.

SECTION – C

Answer any THREE Questions :

(3 × 10 = 30)

16. Write a C program to find simple interest and compound interest.

17. Write a C program to check whether a given number is Armstrong or not.

18. Write a C program to convert the given Binary number into its corresponding Decimal number.

19. Write a C program to find the Factorial of a given number using Recursion.

20. Write a C program to multiply two matrices.

* * * * *
* * * * *

**NUCLEAR PHYSICS**

Under CBCS – Credit 4

Time: **3** HoursMax. Marks: **75****SECTION – A****Answer ALL Questions :****(10 × 1 = 10)**

- Different atomic number and weight but same neutron number nucleoids are _____.
a) isotopes b) isobars c) isotones d) isomers
- Radioactivity was discovered by _____.
a) Madam curie b) Piere curie c) Rutherford d) Henry Becquerel
- Neutron with energy _____ are called slow neutrons.
a) 0 to 1000ev b) 0.5 to 2 Mev c) 2 to 5 Mev d) 5 to 10 Mev
- _____ is used as a fuel in boiling water reactor.
a) uranium b) plutonium c) uranium oxide d) plutonium oxide
- u park has an electric charge of _____.
a) $+\frac{2}{3}e$ b) $-\frac{1}{3}e$ c) $+\frac{1}{3}e$ d) $-\frac{2}{3}e$
- The action of betatron depends on the principle of _____.
- The α spectrum provides a evidence of the existence of _____ energy levels in the nucleus.
- _____ cannot be detected by G.M. counters or ionization chambers.
- _____ principle is made use of in atom bomb.
- According to Hubble's law the universe is _____.

SECTION – B

Answer ALL Questions :

(5 × 7 = 35)

11.a) Explain Wilson cloud chamber and its use.

(OR)

b) In a certain betatron the maximum magnetic field at orbit was

0.4 Wb/m^2 , operating at 50Hz with a stable orbit diameter of

1.524m . Calculate the average energy gained per revolution and

the final energy of the electrons. (Change of electron $e = 1.6 \times 10^{-19} \text{C}$)

12.a) Describe experiments to determine the wavelength of γ rays.

(OR)

b) 1 gram of radioactive substance disintegrates at the rate of

3.7×10^{10} disintegrations per second. The atomic weight of the

substance is 226. Calculate its mean life.

13.a) Explain radio isotopes and their applications.

(OR)

b) The Q value of the $\text{Na}^{23}(n, \alpha) \text{F}^{20}$ reaction is -5.4Mev .

Determine the threshold energy of the neutrons for this reaction.

Mass of neutron $1.008665u$, Mass of $\text{Na}^{23} = 22.9898$.

14.a) Write an account of nuclear fission with diagram.

(OR)

b) Consider a single helium nucleus formed by the fusion of two

deuterium nuclei. Mass of ${}_1\text{H}^2 = 2.014102u$; mass of

${}_2\text{He}^4 = 4.002604u$. Calculate the energy released in fusion.

15.a) Explain about Big Bang Theory.

(OR)

b) Discuss about fundamental interaction between elementary particles.

SECTION – C

Answer any THREE Questions :

(3 × 10 = 30)

16. Explain what is liquid drop model? Explain its principle terms, merits and demerits.

17. Explain in detail about neutrino theory of β decay.

18. Explain the basic properties of neutron.

19. Describe about Boiling water reactor and pressurized water reactor with neat diagram.

20. Describe about particles and antiparticles.

**** ** ***

**CLASSICAL MECHANICS, QUANTUM MECHANICS AND
THEORY OF RELATIVITY**

Under CBCS – Credit 4

Time: **3** HoursMax. Marks: **75****SECTION – A****Answer ALL Questions :****(10 × 1 = 10)**

- If the constraints are independent of time they are termed as _____ constraints.
a) Holonomic b) Non-holonomic c) Scleronomic d) Rheonomic
- Phase space is the _____.
a) Momentum space b) configuration space
c) Both position and momentum space d) Four dimensional space
- The energies of electrons liberated by light depend on the _____ of the light.
a) Frequency b) amplitude c) Phase d) None of these
- The expectation value for p is $\langle p \rangle =$
a) $\frac{\hbar}{i^0} \int \psi^* \frac{\partial \psi}{\partial x} dx$ b) $\frac{h^2}{i^0} \int \psi^* \frac{\partial \psi}{\partial x} dx$
c) $\frac{\hbar}{i^0} \int \psi \frac{\partial \psi}{\partial x} dx$ d) $\frac{h}{i^0} \int \psi^* \frac{\partial \psi}{\partial x} dx$
- When the velocity of a particle approaches the velocity of light its realistic mass becomes _____.
a) Zero b) m_0 c) $2m_0$ d) infinity
- The equation of motion of simple pendulum using Lagrangian method is _____.

7. If a given co-ordinate is cyclic in Lagrangian it will also be cyclic in _____.
8. _____ are produced by the superposition of two waves with different frequencies.
9. The frequency of harmonic oscillator is _____.
10. According to special theory of relativity, the speed of light is _____ in all inertial frames.

SECTION – B

Answer ALL Questions :

(5 × 7 = 35)

11. a) State and explain D' Alembert's principle.

(OR)

- b) Obtain Lagrangian equation of motion for linear Harmonic Oscillator.

12. a) Deduce Hamilton's canonical equations of motion for compound pendulum.

(OR)

- b) Discuss the physical significance of H.

13. a) Write short notes on Compton effect.

(OR)

- b) Find the De Broglie wavelengths of

i) 46 gm golf ball with a velocity of 30 m/s and

ii) an electron with a velocity of 10^7 m/s .

14. a) Derive Schrodinger's time dependent equation.

(OR)

- b) Find the expectation value $\langle x \rangle$ of a position of a particle trapped in a box "l" wide.

15. a) Obtain Einstein's mass energy relation.

(OR)

- b) How fast would a rocket have to go relative to an observer for its length to be contracted to 99% of its length at rest.

SECTION – C

Answer any THREE Questions :

(3 × 10 = 30)

16. Deduce Newton's second law of motion from Hamilton's principle.

17. Deduce Hamilton's canonical equations of motion in different co-ordinate systems.

18. Describe the construction and working of Davison Germer experiment with neat diagram.

19. Explain in detail about the Schrodinger's equation for the hydrogen atom.

20. Describe Michelson – Morley experiment with neat diagram.

**** ** ***


VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.A. / B.Sc. Degree (Semester) Examinations, April 2016

Part – IV : Non-Major Elective Subject : Second Semester : Paper – I

HOUSEHOLD APPLIANCES

Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

SECTION – A
Answer ALL Questions :
(10 × 1 = 10)

1. _____ is a device that supplies electrical energy to one or more electric loads.
2. The term DC stands for _____.
3. The frequency of AC is
 - a) 50 Hz b) 40 Hz c) 60 Hz d) none of the above
4. The transformer works on the principle of electromagnetic induction.
(True / False)
5. Which material is one whose electrical properties lie in between those of insulators and good conductors.
 - a) semiconductor b) insulator c) capacitor d) resistance
6. Electrical energy converted in to _____ energy in electric heaters.
7. CFL stands for Compact Fluorescent Lamp. (True / False)
8. The life time of fluorescent tube is
 - a) 1000 hours b) 10,000 hours c) 100 hours d) none of the above
9. The normal human body temperature is
 - a) 36.9° C b) 40.0° C c) 43.0° C d) 44.0° C
10. The base of the iron box is made up of
 - a) nichrome b) copper c) both a and b d) none of the above

SECTION – B
Answer ALL Questions :
(4 × 10 = 40)

11. a) Define the term AC supply. Compare alternating current and direct current.

(OR)

- b) Discuss the concept of stabilized power supply.

12. a) Write down the theory of transformer and its uses.

(OR)

- b) Discuss the construction and working of a filament lamp.

13. a) Explain the working principle of Light Emitting Diode (LED).

(OR)

- b) Briefly in detail about the role of seven segment display.

14. a) Explain the phenomenon of electric water heaters.

(OR)

- b) Give a short note on instant and immersion rod heaters.

SECTION – C
Answer any TWO Questions :
(2 × 12½ = 25)

15. Define the term earthing. Briefly explain the two types of earthing.
16. Discuss about the working principle and use of the incandescent lamps.
17. Write a brief account of electric heaters.

** ** ** ** ** ** **


VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2016

Part – IV : Skill Based Subject : Fourth Semester : Paper – I

ENERGY SCIENCE – II

Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

SECTION – A
Answer ALL Questions :

(10 × 1 = 10)

- Which is the primary and most universal measure of all kinds of work by human beings and nature
a) energy b) water c) food d) none of the above
- Coal, oil, gas, uranium and hydro are commonly known as _____.
- A combination of suitable modules constitutes an array. (True / False)
- The term BARC stands for
a) Bhabha Atomic Research Centre
b) Babu Atomic Research Centre
c) Bhabha Alternate Research Centre d) none of the above
- A cell capable of generating an electric current by converting the chemical energy of a fuel directly into electrical energy (True / False)
- The main disadvantages of fuel cells are their high _____ costs.
- _____ is an instrument to get high temperatures by concentrating solar radiations onto a specimen.
a) solar furnace b) solar cooker c) solar still d) none of the above
- Basically there are _____ designs of solar cooker
a) three b) five c) seven d) two
- _____ is of course of a form of solar power or solar related power as it is sometimes called
a) wind power b) bio gas c) both a and b d) none of the above
- The biogas can be distributed through GI pipes for domestic use and it can be stored in container which can be transported to consumers.
(True / False)

SECTION – B
Answer ALL Questions :

(4 × 10 = 40)

- a) Discuss about the energy sources.
(OR)
b) List out the advantages and limitations of renewable energy sources?
- a) Explain the concept of solar cell modulus.
(OR)
b) What are the advantages and disadvantages of solar photovoltaic conversion?
- a) Write a brief account of a fuel cell
(OR)
b) What is a solar furnace? Describe the different configurations of it, with sun tracking systems.
- a) Write briefly on the applications of solar energy in space.
(OR)
b) Give the advantages and disadvantages of bio-logical conversion of solar energy.

SECTION – C
Answer any TWO Questions :

(2 × 12½ = 25)

- Discuss about the various applications of solar photovoltaic system.
- Describe the construction and working of a box type solar cooker.
- Give the brief theory of wind energy.

** ** ** ** **


VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2016

Part – IV : Skill Based Subject : Sixth Semester : Paper – I

OPTO ELECTRONICS – II

Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

SECTION – A
Answer ALL Questions :

(10 × 1 = 10)

- Photo detector used in optical fibre is
 - PIN, APDs
 - PIN, Gunn Diodes
 - APD, Gunn diodes
 - None of the above
- Which of the following is the transmission frequency in optical fibre
 - 10^9 Hz
 - 10^{11} Hz
 - 10^{14} Hz
 - None of the above
- Which of the following is having the highest refractive index
 - Diamond
 - air
 - Water
 - glass
- Function of receiver in optical fibre is to
 - Reshape the degraded signal only
 - only amplify of degraded signal
 - Both amplify and reshape the degraded signal
 - none of the above
- Which of the semiconductor can be used to fabricate a LED
 - Si
 - Ge
 - GaAs
 - None
- Source of light for optical fibre is _____.
- Attenuation in optical fibre can be measured in _____.
- Scattering loss in optical fibre varies with wavelength as _____.
- A _____ system requires only a single transmitter and a single receiver module per channel.
- Optical fibre was invented in _____.

SECTION – B
Answer ALL Questions :

(4 × 10 = 40)

- Explain the external chemical vapour deposition and its characteristics.
(OR)
 - Write a short note on Multielement glasses and Phasil system.
- Explain about micro bending losses in optical fibre.
(OR)
 - Explain about Rayleigh scattering losses.
- Explain about Biconically tapered directional coupler.
(OR)
 - Discuss about offset butt joint directional coupler and beam splitting directional coupler.
- Explain about simplex and duplex communication system with neat block diagram.
(OR)
 - List out the different techniques used for fibre fabrication and mention out the types of optical couplers.
 - Compare between Analog and Digital transmitter and Name some types of losses occurred in fibre optics.

SECTION – C
Answer any TWO Questions :

(2 × 12½ = 25)

- Describe briefly about the three process of internal chemical vapour deposition method in optic fibre communication.
- Explain point to point long haul link used in Fibre Optic communication.
- Illustrate the design of a fibre optic receiver.

** ** ** **



VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2016

Part – IV : Skill Based Subject : Sixth Semester : Paper – II

PHYSICS FOR COMPETITIVE EXAMINATIONS

Under CBCS – Credit 2

Time: **2 Hours**

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(75 × 1 = 75)

1. Which of the following statements is dimensionally correct?
 - a) pressure is energy per unit area
 - b) pressure is force per unit length
 - c) pressure is energy per unit length
 - d) pressure is force per unit volume
2. The foundations of dimensional analysis were laid down by
 - a) Einstein b) Galileo c) Newton d) Fourier
3. Newton's first law of motion gives the concept of
 - a) energy b) work c) inertia d) momentum
4. A wound watch spring
 - a) has no energy stored in it
 - b) has mechanical K.E. stored in it
 - c) has mechanical P.E. stored in it
 - d) has electrical energy stored in it
5. A rocket or jet engine works on the principle of
 - a) conservation of linear momentum
 - b) conservation of angular momentum
 - c) conservation of energy d) conservation of mass
6. Which of the following force is conservative
 - a) Electrostatic b) Frictional c) Viscous d) Air resistance
7. Newton's second law gives the measure of
 - a) acceleration b) force c) momentum d) angular momentum
8. Which of the following is not possible for a moving body
 - a) constant velocity and varying speed

- b) negative acceleration and positive velocity
c) constant speed and varying velocity
d) Instantaneous velocity equal to average velocity
9. An inertial frame is one in which
a) Newton's first law of motion is valid
b) Newton's second law of motion is valid
c) Newton's third law is valid d) none of the above is true
10. The angular speed of the second's hand of a watch in $\frac{\text{radians}}{\text{sec}}$ is
a) 60 b) π c) $\frac{\pi}{30}$ d) 2
11. A full circle contains
a) $\frac{\pi}{2} \text{ rad}$ b) $2\pi \text{ rad}$ c) $\frac{\pi}{4} \text{ rad}$ d) $\pi \text{ rad}$
12. A body is moving in a circular path with a constant speed, it has
a) a constant velocity b) a constant acceleration
c) an acceleration of constant magnitude
d) an acceleration which varies with time
13. If a particle moves in a circle, describing equal angles in equal times, its velocity vector
a) remains constant b) changes in magnitude
c) changes in direction d) changes both in magnitude and direction
14. A stone of mass m is tied to a string of length l and rotated in circle with a constant speed V . If the string is released the stone flies
a) radially inward b) radially outward
c) tangentially outward d) with an acceleration $\frac{mV^2}{l}$
15. A mass is falling freely under gravity and in the course of its motion it explodes into a number of smaller fragments, the centre of mass of the final fragments will be
a) about the point of explosion b) on the same vertical line
c) at the point of explosion d) none of the above
16. In the absence of external force the velocity of centre of mass is
a) zero b) constant c) increases d) decreases
17. The centre of mass of two particles lies
a) on the line joining them
b) perpendicular to the line joining them
c) at any point other than the line joining them
d) none of the above
18. The total linear momentum of a system consisting of N number of particles about the centre of mass is
a) zero b) constant c) maximum d) none of the above
19. Angular momentum is equal to the product of
a) moment of inertia and angular velocity
b) mass and angular velocity
c) linear velocity and angular velocity
d) radius and centripetal force
20. A quantity not involved directly in rotational motion of the body is
a) moment of inertia b) torque c) angular velocity d) mass
21. The moment of momentum is called
a) angular momentum b) torque c) impulse d) couple
22. In a nuclear reaction the reactants and the resultants must always be in conformity with the law of conservation of
a) charge number b) mass number
c) both charge and mass numbers d) none of the above
23. Which one of the following is a good nuclear fuel
a) Plutonium – 239 b) Uranium – 236
c) Thorium – 236 d) Neptunium – 239
24. The nuclear area is measured in
a) mils b) barn c) lux d) angstrom
25. The average numbers of neutrons released by the fission of one uranium atom is?
a) 1.5 b) 2.5 c) 3.5 d) 6
26. The colour of a star is an indication of its
a) size b) distance from the earth
c) weight d) temperature
27. Mercury thermometers can be used to measure temperatures upto
a) 360°C b) 500°C c) 260°C d) 100°C

28. Celsius is a unit
 a) of electric potential difference b) of trigonometric angel
 c) equivalent to degree Kelvin d) equivalent to degree centigrade
29. Molecules of gas behave like
 a) perfectly elastic rigid sphere b) inelastic rigid sphere
 c) inelastic non-rigid sphere d) perfectly elastic non-rigid sphere
30. Gas filled in container exerts pressure
 a) on bottom and top only b) on the bottom only
 c) equal on all sides of container
 d) different on different sides of the container
31. When a gas is in thermal equilibrium, its molecules have
 a) a certain constant energy b) the same energy
 c) different energies which remain constant d) zero energy
32. The internal energy of a gram molecule of an ideal gas depends on
 a) pressure only b) volume only
 c) temperature alone d) both on pressure as well as temperature
33. Which of the following gases possesses maximum root mean square velocity?
 a) Hydrogen b) Carbon dioxide c) Nitrogen d) Oxygen
34. The kinetic energy of a gram molecule of the gas is
 a) $\frac{1}{2} RT$ b) $\frac{3}{2} RT$ c) $\frac{5}{2} RT$ d) $\frac{7}{2} RT$
35. In an adiabatic process
 a) pressure remains constant b) volume remains constant
 c) temperature remains constant
 d) temperature does not remain constant
36. The gas law, $PV = RT$; is true for
 a) isothermal changes only b) adiabatic changes only
 c) both isothermal and adiabatic changes only
 d) none of the above
37. When the value of cycle tube is removed, the temperature of air coming out of the tube
 a) decreases b) increases
 c) remains unchanged d) first decreases and then increases

38. The most efficient heat engine is one which is
 - a) irreversible
 - b) reversible
 - c) driven by high speed diesel
 - d) driven by electricity
39. In a reversible isochoric change
 - a) $\Delta W = 0$
 - b) $\Delta P = 0$
 - c) $\Delta T = 0$
 - d) $\Delta U = 0$
40. Heat transfer by conduction in a metal bar is analogous to
 - a) energy transport
 - b) momentum transport
 - c) temperature change
 - d) fluid movement or transport
41. Thermal radiations are electromagnetic radiations belonging to
 - a) ultraviolet region
 - b) infrared region
 - c) visible region
 - d) gamma ray region
42. Nature of thermal radiations is similar to the nature of
 - a) sound waves
 - b) gravitational waves
 - c) light waves
 - d) none of the above
43. The spectrum of black body radiations is
 - a) continuous
 - b) line
 - c) band
 - d) none of the above
44. Absorptive power of a perfectly black body is
 - a) greater than 1
 - b) less than 1
 - c) equal to 1
 - d) zero
45. Heat energy for its propagation requires essentially
 - a) no medium
 - b) air
 - c) dense medium
 - d) liquid medium
46. The period of a simple pendulum is doubled when
 - a) its length is doubled
 - b) the mass of the bob is doubled
 - c) the length is made 4 times
 - d) the mass of bob and the length of the pendulum are doubled
47. In an S.H.M. the acceleration of a particle is zero when
 - a) the velocity is maximum
 - b) the velocity is zero
 - c) the velocity is half of its maximum value
 - d) the velocity is one-third of its maximum value
48. $\frac{N}{kg}$ is the unit of
 - a) force
 - b) acceleration
 - c) velocity
 - d) distance
49. The unit of electric field strength is
 - a) $\frac{volt}{coulomb}$
 - b) $\frac{newton}{ampere}$
 - c) $\frac{newton}{coulomb}$
 - d) $\frac{dyne}{ampere}$

50. MKSA system of units was first introduced by
a) Newton b) Giorgi c) Bohr d) Fermi
51. Which one of the following is unit of energy?
a) watt b) joule c) newton d) $\frac{\text{newton}}{m}$
52. Which one of the following quantities in electricity is analogous to mass in mechanics?
a) Potential b) Resistance c) Inductance d) Charge
53. The temperature coefficient of resistance is positive for
a) aluminium b) carbon c) germanium d) none of the above
54. Which one of the following is the best material for making connecting wires?
a) Aluminium b) Constantan c) Copper d) Nichrome
55. With the rise in temperature, the resistance of a given resistor
a) decreases b) increases
c) first increases and then decreases d) remain constant
56. Magnetic effect of current was discovered by
a) Faraday b) Oersted c) Ampere d) Bohr
57. An electric charge in uniform motion produces
a) an electric field only b) a magnetic field only
c) both electric and magnetic fields d) no such field at all
58. One ampere is equivalent to
a) $1 \text{ coulomb} \times 1 \text{ sec}$ b) $1 \text{ coulomb} / \text{sec}$
c) $1 \text{ Joule} \times \text{coulomb}$ d) $1 \text{ Joule} / \text{coulomb}$
59. The practical unit of current is
a) Coulomb b) Ampere c) Volt d) Ohm
60. The best instrument for the accurate measurement of e.m.f. of a cell is
a) a voltmeter b) an ammeter
c) a potentiometer d) Wheatstone bridge
61. Peltier effect
a) reversible b) irreversible
c) neutral, depending upon temperature d) none of the above
62. Lenz's law is a consequence of the law of conservation of
a) energy b) momentum c) mass d) charge

63. The knowledge of electromagnetic induction has been used in the construction of
a) electric motor b) generator c) voltmeter d) galvanometer
64. In a step-up transformer, voltage in the secondary increases and current
a) increases b) decreases c) remains unchanged d) none of the above
65. Choke coil works on the principle of
a) self-induction b) mutual inductor
c) dynamically induced e.m.f. d) none of the above
66. Alternating current is one which changes in
a) direction b) magnitude
c) magnitude as well as direction d) none of the above
67. Pure choke consumes
a) maximum power b) minimum power
c) no power d) average power
68. The study of positive rays helped in the discovery of
a) proton b) isotopes c) electron d) α - particles
69. X-rays are similar in nature to
a) Cathode rays b) Gamma rays c) Positive rays d) α - rays
70. Nuclear forces are
a) charge independent b) charge dependent
c) charge independent for lighter nuclei and charge dependent for heavy nuclei d) none of the above
71. Thermionic emission is the phenomenon of
a) emission of electrons b) emission of photons
c) emission of neutrons d) emission of protons
72. Radar is a device for detection of
a) distant object b) an instrument for measuring rate
c) an instrument of measuring speed d) a type of telephone
73. The planet having no atmosphere on it is
a) Earth b) Venus c) Mars d) Mercury
74. The tail of a comet points
a) towards the sun b) away from the sun
c) in all possible directions d) none of the above
75. The radix of the binary number is
a) 1 b) 2 c) 8 d) 10


VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2016

Part – IV : Skill Based Subject : Sixth Semester : Paper – III

MEDICAL INSTRUMENTATION

Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

SECTION – A
Answer ALL Questions :

(10 × 1 = 10)

- Physiological parameters of our biological systems are
 - velocity of blood flow
 - blood pressure
 - temperature
 - all the above
- The ability of an instrument to detect even a very small change in the input is called
 - sensitivity
 - linearity
 - accuracy
 - none of the above
- Which one of the following is called “cardiac pacemaker”?
 - Atrio-ventricular node
 - Sino Atrial node
 - Purkinjie fibres
 - none of the above
- In a ventilator, the volume of exhaled air is measured by
 - spirometer
 - nebulizer
 - humidifier
 - all of the above
- In diathermy process, very high frequency current is used, because
 - to avoid intense muscle activity
 - to avoid electrocution hazard to patient
 - both a and b
 - neither a nor b
- Servo controlled Ventilators work in _____ mode.
- An anesthetic is mixture of Nitrous oxide, Fluorocarbon and _____.
- In our body 80 % of atoms are _____.
- Gamma ray camera is used when the patient is injected with _____.
- Positron is the anti-particle of _____.

SECTION – B
Answer ALL Questions :

(4 × 10 = 40)

- a) Draw the block diagram of a bio-medical instrument system and explain.

(OR)

- Explain about Bipolar Limb Leads system used in ECG.

- a) Draw a typical ECG wave and discuss about it.

(OR)

- What are the four types of Brain waves? Explain.

- a) List out the techniques used in surgical diathermy.

(OR)

- Describe Laser principle.

- a) Explain the working of Gamma ray camera.

(OR)

- Discuss about Positron Emission Tomography.

SECTION – C
Answer any TWO Questions :

(2 × 12½ = 25)

- Explain ECG recording setup with block diagram.
- Explain the working of Anesthesia machine.
- Draw the block diagram of MRI system.

** ** ** ** **

**PHYSICS – II**

Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: 75

SECTION – A**Answer ALL Questions :****(10 × 1 = 10)**

- Electric potential at a point due to a point charge varies with distance of the point as
 a) r b) $\frac{1}{r}$ c) r^2 d) $\frac{1}{r^2}$
- The unit of magnetic induction 'B' is _____.
 a) *weber* b) $\frac{\text{weber}}{m^2}$ c) $\frac{\text{Newton}}{\text{Ampere} - m}$ d) $\frac{\text{Newton}}{\text{meter}}$
- A transistor is a _____ operated device.
 a) current b) voltage
 c) both voltage and current d) none of the above
- Einstein's mass energy relation is _____.
 a) $m c^4$ b) $\frac{m}{c^2}$ c) $m c^2$ d) $m^2 c$
- _____ discovered X-rays.
 a) Moseley b) Roentgen c) Rutherford d) Bohr
- Colulomb is the unit of _____.
- Magnetic effect of current was discovered by _____.
- _____ diode operates in the reverse breakdown region.
- According to special theory of relativity _____ of light in free space is constant.
- The Balmer series of the hydrogen spectral lines lies in _____ region.

SECTION – B

Answer ALL Questions :

(5 × 7 = 35)

11. a) Obtain the relation between electric field & electric potential.

(OR)

b) A positive charge of $q_1 = 2 \times 10^{-7} C$ is placed at a distance of $0.15m$ from another positive charge of $q_2 = 8 \times 10^{-7} C$. At what point on the line joining them is the electric field zero?

12. a) Calculate magnetic induction due to a straight conductor carrying current.

(OR)

b) A standard capacitor of capacitance $0.1\mu F$ is charged by a potential difference of 2 volts. It is then discharged through a ballistic galvanometer which gives a linear throw of $20cm$ on a scale at a distance of 1 meter from the mirror of the B.G. Calculate the charge sensitiveness of the galvanometer.

13. a) Write a note on i) LED and ii) Photo diode

(OR)

b) Convert the i) Decimal $(13)_{10}$ to Binary and
ii) Binary $(110011)_2$ to Decimal

14. a) On basis of theory of relativity, explain time dilation.

(OR)

b) How fast would a rocket have to go relative to an observer for its length to be contracted to 99% of its length at rest?

15. a) Explain Rutherford's experiment on scattering of α – particles.

(OR)

b) Calculate the radius and energy of the electron in the n^{th} orbit in hydrogen from the following data: $e = 1.6 \times 10^{-19} coulomb$;
 $m = 9.1 \times 10^{-31} kg$; $h = 6.66 \times 10^{-34} joule\ second$; $\epsilon_0 = 8.85 \times 10^{-12} \frac{farad}{meter}$ and $c = 3 \times 10^8 \frac{m}{s}$.

SECTION – C

Answer any THREE Questions :

(3 × 10 = 30)

16. Derive expression for the electric field at a point on the

a) axial line b) equatorial line due to an electric dipole

17. Describe the construction and theory of a moving coil ballistic galvanometer.

18. Draw the common emitter mode transistor circuit diagram and explain how it is used to draw the characteristic curves experimentally.

19. Derive an expression for the variation of mass with its velocity.

20. With a neat sketch explain the construction and working of Bragg X-ray spectrometer.

**** ** ** ** ****

**VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST**

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.A. / B.Sc. Degree (Semester) Examinations, April 2016

Part – IV : Non-Major Elective Subject : Second Semester : Paper – I

CIVIL DEFENCE AND ADVENTURE TRAINING

Under CBCS – Credit 2

Time: **2 Hours**Max. Marks: **75****SECTION – A****Answer ALL Questions :****(10 × 1 = 10)**

- The angle between the heels in soudhan position is
a) 30° b) 40° c) 45° d) 60°
- In tez chal, the distance between cadets is
a) 45” b) 30” c) 60” d) 75”
- In ADHA paye mur, the squad turn
a) 45° b) 180° c) 90° d) 30°
- Sequence of firing is
a) HAT b) ATH c) HTA d) AHT
- A line cadet stand side by side is called
a) Rank b) file c) blank file d) None of these
- In MR, yellow color represents
a) living area b) Cultivated area c) Reserved forest d) dry river
- The word of command for THAM finishes on _____ foot in marching.
a) left b) right c) left or right d) none of these
- The angle between five fingers stretched in hands method is
a) 19° b) 12° c) 8° d) 5°
- Expand the term MR:
- Expand the term JD:

SECTION – B**Answer ALL Questions :****(4 × 10 = 40)**

- Define the following terms: i) Rank ii) File and iii) blank file
(OR)
b) What are the types of adventure training?
- Write the five aims of Drill.
(OR)
b) What are the basic requirements of good firer?
- What are the types of leaders?
(OR)
b) Differentiate between ‘line tor’ and ‘vissarjan’.
- Write the ten parts of the liquid prismatic compass.
(OR)
b) Explain the functions of Civil defence.

SECTION – C**Answer any TWO Questions :****(2 × 12½ = 25)**

- Explain the different types of judging distance in field graft.
- Explain the parts of the 0.22 rifle.
- What is a Map? Write six types of maps.

** ** ** ** **