



Course Code: 06AT01

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

Residential & Autonomous – A Gurukula Institute of Life-Training
Re-accredited (3rd Cycle) with 'A' Grade (CGPA 3.59 out of 4.00) by NAAC
[Affiliated to Madurai Kamaraj University]

B.Sc. Mathematics / Chemistry Degree (Semester) Examinations, November 2020

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

Course Title: Allied Physics- I

Under CBCS and OBE – Credit 4

Time: **3** Hours

Max. Marks: **75**

SECTION – A

Answer ALL Questions:

(10 X 1 = 10 Marks)

1. Sound waves of frequency more than 20,000 Hz are called
 - a) Infrasonic
 - b) Ultrasonics
 - c) Audible range
 - d) amplitude
2. The noise which produced inside the hall is called
 - a) Air borne noise
 - b) structure borne noises
 - c) Echelon effect
 - d) inside noises
3. The restoring force per unit area is
 - a) Strain
 - b) Stress
 - c) Compression
 - d) elongation
4. The dimensional formula of modulus of elasticity is
 - a) $ML^{-1}T^{-2}$
 - b) $ML^{-2}T^{-1}$
 - c) $ML^{-2}T^{-2}$
 - d) ML^1T^2
5. The unit of entropy is
 - a) JK
 - b) JKg^{-1}
 - c) JK^{-1}
 - d) J/Sec
6. “No entropy change takes place when pure crystalline solids react at absolute zero” stated by
 - a) Planck statement
 - b) Nernst statement
 - c) clausius statement
 - d) unattainability statement
7. Who first noticed the magnetic effect of electric current?
 - a) Newton
 - b) Oersted
 - c) Coulomb
 - d) Fleming
8. The SI unit of magnetic induction (B) is
 - a) henry
 - b) tesla
 - c) ampere
 - d) volt
9. When a ray of light falls on the boundary separating the two media, there is a change in direction of the ray. This phenomenon is known as
 - a) reflection
 - b) refraction
 - c) total internal reflection
 - d) diffraction
10. The refractive index of material of prism
 - a) $\sin (A+D/2) / \sin A/2$
 - b) $\cos (A+D/2) / \sin A/2$
 - c) $\sin (A+D/2) / \cos A/2$
 - d) $\cos (A+D/2) / \cos A/2$

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

11. Define simple harmonic motion.
12. State Hooke's law.
13. List out the different modulus of elasticity.
14. Define Entropy.
15. state Ampere swimming rule.
16. What is a switch?

17. What is Snell's law ?

SECTION – C

Answer ALL Questions:

(5 X 5 = 25 Marks)

18. a) Discuss the necessary theory, the composition of two simple harmonic motions of equal time periods at right angles to each other. Discuss the important cases.

(OR)

b) The volume of a room is 600 m^3 . The wall area of the room is 220 m^2 , the floor area is 120 m^2 and the ceiling area is 120 m^2 . The average sound absorption coefficient, i) for the walls is 0.03; ii) for the floor is 0.06 and iii) for the ceiling is 0.80. Calculate the average sound absorption coefficient and the reverberation time.

19. a) Obtain an expression for the bending of a beam.

(OR)

b) i) Find the energy stored in a wire 5 m long and 10^{-3} m in diameter when it is stretched through $3 \times 10^{-3} \text{ m}$ by a load. Young's modulus of material is $2 \times 10^{11} \text{ Nm}^{-2}$.

ii) A bar of length 1m, breadth 0.02 m and thickness 0.005 m is supported at its two ends and loaded in the middle. For a load of 0.4 kg, the depression at the centre is $2 \times 10^{-3} \text{ m}$. Calculate the young's modulus of the material of the bar.

20. a) State and explain i) First law of thermodynamics ii) Second law of thermodynamics.

(OR)

b) i) Calculate the change in entropy when 10^{-2} kg of ice at 0°C is converted into water at the same temperature. Given that the specific latent heat of fusion of ice is $3.36 \times 10^5 \text{ Jkg}^{-1}$

ii) Calculate the change in entropy when 5 kg of water at 100°C is converted into steam at the same temperature.

21. a) State and explain Biot Savart law. **(OR)**

b) An electric lamp which runs at 100 volts D.C. and 10 ampere current is connected to 220 volts 50 Hz A.C. mains. Calculate the inductance of choke in the circuit.

22. a) Obtain an expression for the refractive index of material of prism.

(OR)

b) Explain a direct vision spectroscope.

SECTION – D

Answer Any Three Questions:

(3 X 10 = 30 Marks)

23. Discuss the factors that affect the acoustics in a hall and the remedies for them.

24. Describe Jaeger's method of studying the variation of surface tension of water with temperature.

25. Explain the working principle of Carnot's heat engine.

26. Obtain the relation for magnetic induction at a point on the axis of a circular coil.

27. What is spherical aberration? Explain about the three methods of minimising spherical aberration.



Course Code: 06CT11

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B.Sc., Physics Degree (Semester) Examinations, November 2020

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

Course Title: MECHANICS

Under CBCS and OBE – Credit 4

Time: **3 Hours**

Max. Marks: **75**

SECTION – A

Answer ALL Questions:

(10 X 1 = 10 Marks)

1. The dimension of force is CO1
a) MLT^{-1} b) MLT^{-2} c) $ML^{-1}T$ d) $ML^{-1}T^2$
2. Which one is a vector? CO1
a) Length b) Volume c) Velocity d) Work
3. The trajectory (or path) of a projectile is. CO2
a) Straight line b) Parabola c) Hyperbola d) Circle
4. A football player will throw a football at maximum distance if the angle of projection is: CO2
a) 30° b) 45° c) 60° d) 90°
5. The center of mass of the system consisting of Earth, the Sun, and the planet Mars is: CO3
a) closer to Earth than to either of the other bodies
b) closer to the Sun than to either of the other bodies
c) closer to Mars than to either of the other bodies
d) at the geometric center of the triangle formed by the three bodies
6. The center of mass of Earth's atmosphere is: CO3
a) a little less than halfway between Earth's surface and the outer boundary of the atmosphere
b) near the surface of Earth
c) near the outer boundary of the atmosphere
d) near the center of Earth
7. The time rate change of angular momentum of a particle is the net _____ acting on the particle CO4
a) moment b) velocity c) torque d) force
8. The time rate change of linear momentum of a particle is the net _____ acting on the particle CO4
a) moment b) velocity c) torque d) force
9. The magnitude of normal force per unit surface area is called _____ CO5
a) displacement b) velocity c) pressure d) viscosity
10. The ratio of mass to volume of a given object is called _____ CO5
a) pressure b) density c) force d) energy

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

- | | |
|---|-----|
| 11. What is the significance of mass in mechanics? | CO1 |
| 12. What do you infer from Newton's third law? | CO1 |
| 13. State the nature of acceleration and velocity in uniform circular motion. | CO2 |
| 14. Differentiate between static friction and kinetic friction. | CO2 |
| 15. What are impulsive forces? | CO3 |
| 16. State work-energy theorem. | CO4 |
| 17. Define the term pressure. | CO5 |

SECTION – C

Answer ALL Questions:

(5 X 5 = 25 Marks)

- | | |
|--|-----|
| 18 a) Define the terms Mass and Weight. Distinguish between Mass and Weight. | CO1 |
| [OR] | |
| b) A force acts in a 2 kg mass and gives it an acceleration of 3 met / sec ² . What acceleration is produced by the same force when acting on a mass of a) 1 kg b) 4 kg c) How large is the force? | CO1 |
| 19 a) Obtain Newton's laws in three dimensional vector form. | CO2 |
| [OR] | |
| b) A bowling ball with an initial velocity of 3 met / sec rolls along a level floor for 50 met before coming to a stop. What is the co-efficient of rolling friction? | CO2 |
| 20 a) State and explain "Law of conservation of Linear momentum". | CO3 |
| [OR] | |
| b) A baseball of mass 0.14 kg is moving horizontally at a speed of 42 m/s when it is struck by the bat. It leaves the bat in a direction at an angle of $\phi = 35^\circ$ above its incident path and with a speed of 50 m/s. a) Find the impulse of the force exerted on the ball b) Assuming the collision last for 1.5 ms, what is the average force? | CO3 |
| 21 a) Discuss about angular momentum of a particle. | CO4 |
| [OR] | |
| b) A 40 kg woman runs up a staircase 4 met high in 5 sec. Find her minimum power output. | CO4 |
| 22 a) Describe the pressure of a fluid. | CO5 |
| [OR] | |
| b) A 65 kg woman balances on the heel of her right shoe, which has a circular base 1 cm in radius. How much pressure does she exert on the ground? | CO5 |

SECTION – D

Answer Any Three Questions:

(3 X 10 = 30 Marks)

- | | |
|---|-----|
| 23. Illustrate the significance of Newton's first, second and third laws of motion with examples. | CO1 |
| 24. Derive the equation to calculate the horizontal range of 'R' of a particle. | CO2 |
| 25. Deduce Newton's Second law in the case of many particle systems. | CO3 |
| 26. Derive work-energy theorem and explain its significance. | CO4 |
| 27. Arrive at the Bernoulli's equation for an ideal fluid flow. | CO5 |

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Course Code: 06CT12

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B.Sc.Physics Degree (Semester) Examinations, November 2020

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

Course Title: Electromagnetism

Under CBCS and OBE – Credit 4

Time: 3 Hours

Max. Marks: 75

SECTION – A

Answer ALL Questions:

(10 X 1 = 10 Marks)

- The SI unit of charge is
a) Ohm b) Farad c) Volt d) Coulomb
- The measured value of ϵ_0 is
a) $8.85418 \times 10^{-10} \text{Fm}^{-1}$ b) $8.85418 \times 10^{-12} \text{Nm}^{-1}$ c) $8.85418 \times 10^{-12} \text{Fm}^{-1}$ d) $8.58418 \times 10^{-12} \text{Fm}^{-1}$
- The relation between the electric field and electric potential is
a) $E = -\text{grad } V$ b) $E = -\text{Div } V$ c) $E = \text{Curl } V$ d) $E = -\text{curl } V$
- The SI unit of Potential difference is
a) Newton b) Farad c) Coulomb d) Volt
- The Carey foster bridge is a form of
a) Anderson bridge b) wheatstones bridge c) Kelvin double bridge d) none of the above
- Which of the following device for measuring or comparing potential differences
a) Carey foster bridge b) Kelvin double bridge c) potentiometer d) seeback effect
- The Biot-savart's law is a general modification of
a) Kirchhoffs law b) Lenz's law c) Ampere's law d) Faraday's laws
- The SI unit of Magnetic flux is
a) Wbm^2 b) Wb/m^2 c) Weber d) Wb/m^3
- The parallel resonant circuit is known as
a) acceptor circuit b) rejector circuit c) divider circuit d) all of the above
- It is a device for converting a low alternating voltage at high current into a high alternating voltage at low current and vice versa
a) Choke coil b) Tesla coil c) Transformer d) oscillator

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

- Define potential difference.
- Write down about the potential due to a group of point charges.
- Write down the principle of Potentiometer.
- Define Magnetic induction.
- Write down the Lorentz force equation.
- State ampere circuital law
- What is choke coil?

SECTION – C

Answer ALL Questions:

(5 X 5 = 25 Marks)

18. a) What is a line of force? Write down the properties of lines of force (OR)
- b) i) ABCD is a square of 4 cm side. Charges of 16×10^{-9} , -16×10^{-9} and 32×10^{-9} C are placed at the point A, C and D respectively. Find the intensity of the electric field at point B.
- ii) 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 of joining them is the electric field zero?
19. a) Derive an expression for the combined capacitance of three capacitors connected in
- i) series and ii) Parallel

(OR)

- b) Calculate the force between the plates of a parallel plate capacitor, when the area of the plate is 300 cm^2 each, the separation is 0.5 cm and they are charged to P.D 1000 volts.
20. a) Derive the equation of continuity.
- (OR)
- b) A copper wire of diameter 0.5 mm and length 20 m is connected across a battery of emf 1.5 V and internal resistance 1.25 ohm. 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.
21. a) Draw a circuit diagram to compare the capacitances of two capacitors using ballistic galvanometer and explain it.

(OR)

- b) A circular coil has a radius of 0.1m and number of turns of 50. Calculate the magnetic induction at a point i) on the axis of the coil and distance 0.2 m from the centre ii) at the centre of the coil, when a current of 0.1A flows in it.
22. a)) Compare series and parallel resonance circuits (OR)
- b) An electric lamp which runs at 100 volts D.C. and 10 ampere current is connected to 220 volts 50 Hz A.C. mains. Calculate the inductance of choke in the circuit.

SECTION – D

Answer Any Three Questions:

(3 X 10 = 30 Marks)

23. Derive an expression for the electric field at any point due to a electric dipole at axial line and equatorial line.
24. Calculate the capacitance of a spherical capacitor when the outer sphere and the inner sphere are earthed.
25. Explain with necessary theory how a Carey Foster's bridge may be used to calculate the resistance of a coil.
26. Explain the principle, construction and theory of a moving coil galvanometer.
27. Describe the principle of LCR series resonance circuit and also obtain the resonant frequency.



Course Code: 06CT31

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B.Sc. Physics Degree (Semester) Examinations, November 2020

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

Course Title: PRINCIPLES OF ELECTRIC CIRCUITS

Under CBCS and OBE – Credit 4

Time: **3** Hours

Max. Marks: **75**

SECTION – A

Answer ALL Questions:

(10 X 1 = 10 Marks)

1. Ideal voltage source has an internal resistance of
 - a) zero
 - b) infinite
 - c) mega ohm
 - d) milli ohm
2. Maximum power is delivered across the load when
 - a) $R_S = R_L$
 - b) $R_S > R_L$
 - c) $R_L > R_S$
 - d) $R_L \neq R_S$
3. The polar form of the complex number $8 + j6$ is
 - a) $10 \angle 36.87^\circ$
 - b) $10 \angle -36.87^\circ$
 - c) $12 \angle 28.36^\circ$
 - d) $11 \angle 36.87^\circ$
4. If the peak value of a sine wave is 20 V, the peak to peak value is
 - a) 20 V
 - b) 40 V
 - c) 5V
 - d) 30 V
5. The Ohms law for the current I in RC circuit is
 - a) $\frac{V}{Z}$
 - b) VZ
 - c) $\frac{Z}{V}$
 - d) IZ
6. Power in a capacitor, called
 - a) average power
 - b) apparent power
 - c) capacitive power
 - d) reactive power
7. The inductive reactance of RL circuit is
 - a) $2\pi f L$
 - b) $\frac{1}{2\pi f L}$
 - c) $2\pi f C$
 - d) $\frac{1}{2\pi f C}$
8. Current _____ voltage in an RL circuit
 - a) equals
 - b) leads
 - c) lags
 - d) not equals
9. The phase angle between the source voltage and current of a series RLC circuit at Resonance is
 - a) -90°
 - b) $+90^\circ$
 - c) 0°
 - d) dependent on the reactance
10. Band width of the resonant filter is
 - a) $\frac{f_r}{Q}$
 - b) $\frac{X_L}{Q}$
 - c) $\frac{X_C}{Q}$
 - d) $\frac{Q}{f_r}$

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

11. Define series – parallel resistive circuit.
12. State maximum power transfer theorem.
13. What is phasor ?
14. Convert $8 + j6$ to polar form.
15. Define conductance, capacitive susceptance and admittance.
16. Calculate the power factor when $\theta = 50^\circ$.
17. What is critical frequency?

SECTION C

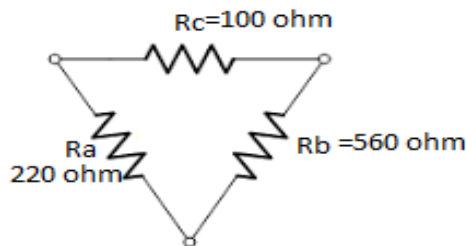
Answer ALL Questions:

5 x 5 = 25 Marks

18. a) Explain Thevenin's theorem

(Or)

- b) Convert the delta network to wye network for the given circuit.



19. a) How do you determine various voltage and current values of a sine wave?

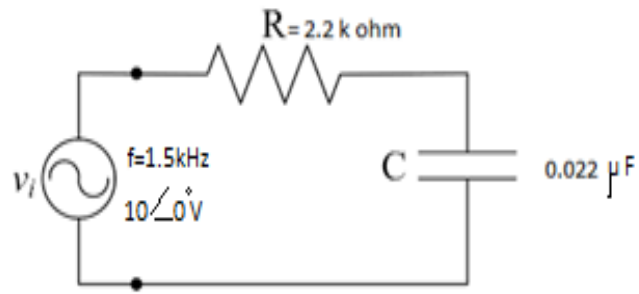
(Or)

- b) i) Subtract $1 + j2$ from $3 + j4$ ii) Divide $100 \angle 50^\circ$ by $25 \angle 20^\circ$

20. a) Describe the relationship between current and voltage in a series RC Circuit.

(Or)

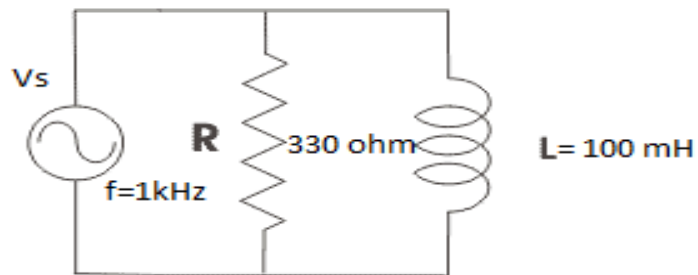
- b) Determine the current in the following circuit and draw a phasor diagram showing the relation between source voltage and current.



21. a) How to determine the impedance of a series RL circuit?

(Or)

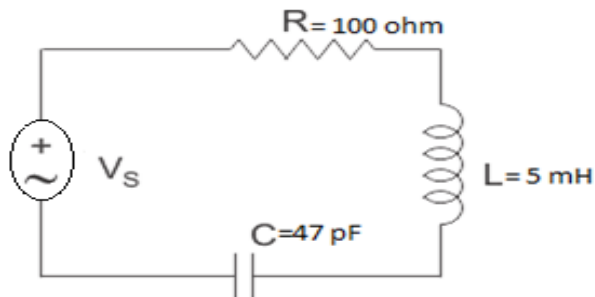
b) Determine the total admittance and draw the admittance phasor diagram.



22. a) Analyze series RLC circuit.

(Or)

b) Find the series resonant frequency for the given circuit

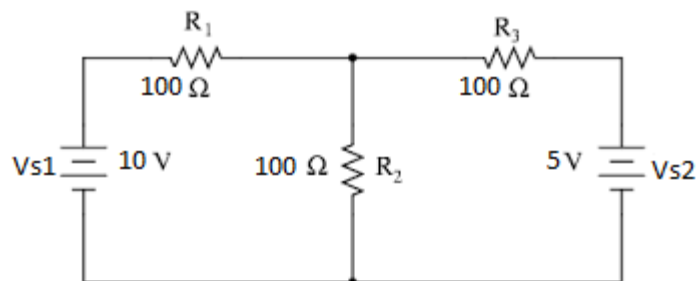


SECTION – D

ANSWER any Three QUESTIONS

3 X 10 = 30 Marks

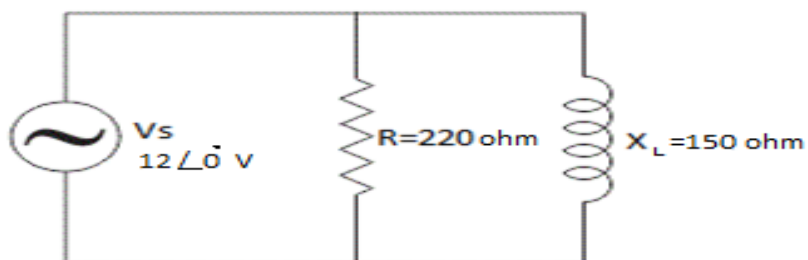
23. Using superposition theorem, find the current through the resistor R_2



24. Write the characteristics of basic non sinusoidal wave forms.

25. Discuss how the RC circuit operates as a filter.

26. Determine the value of each current in the given circuit and draw the current phasor diagram.



27. Analyse the operation of band pass and band stop filters.





Course Code:06CT32

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B.Sc. Physics Degree (Semester) Examinations, November 2020

Part – III : Core Subject : Third Semester : Paper – II

Course Title: SPECTROSCOPY

Under CBCS and OBE – Credit 4

Time: 3 Hours

Max. Marks: 75

SECTION – A

Answer ALL Questions:

(10 X 1 = 10 Marks)

- In Rutherford experiment, scattering of α particles is due to _____ between the α particle and the positive charge of the nucleus
a) electrostatic repulsive force b) gravitational force c) electrostatic attractive force
d) all the above
- Any new theory in Physics must reduce to corresponding classical theory under special conditions is called
a) relativistic theory b) quantization theory c) correspondence principle d) all the above
- Smallest unit of magnetic dipole moment is
a) gyromagnetic ratio b) Bohr magneton c) Lande's splitting factor d) All the above
- Stern and Gerlach experiment based on the behaviour of magnetic dipole in
a) uniform magnetic field b) non-uniform magnetic field
c) uniform electric field d) non-uniform electric field
- Which among the following is a linear molecule?
a) Water b) Hydrogen chloride c) Methane d) Boron trichloride
- Which among the following is used as source in Microwave spectroscopy?
a) Klystron b) Magnetron c) Cyclotron d) Betatron
- Compression and extension of a bond in a molecule, obeys _____ like a spring.
a) Hubble's law b) Boyle's law c) Hooke's law d) Coulomb's law
- The material used as source in IR spectrometer is
a) Nernst filament b) iron filament c) tungsten filament d) copper filament
- Ideal source for Raman spectrometer is
a) Lasers b) Glass c) Quartz d) Sodium Chloride
- The relationship between polarizability of a molecule and induced dipole moment is given by
a) $\mu = \alpha E$ b) $\mu = \alpha E^2$ c) $\mu = \alpha^2 E$ d) $\mu = \alpha^2 E^2$

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

- State correspondence principle
- What is gyromagnetic ratio?
- Write notes on symmetric top molecules
- What are hot bands?
- Differentiate stokes and anti-stokes radiation

16. Mention the two ways of exciting an atom
17. What is Zeeman effect?

SECTION – C

Answer ALL Questions:

(5 X 5 = 25 Marks)

18. a) List out the concepts which favour Bohr's theory (OR)
b) Calculate the radius and energy of the electron in the n^{th} orbit in hydrogen from the following data: $e = 1.6 \times 10^{-19} \text{ C}$; $m = 9.1 \times 10^{-31} \text{ kg}$; $h = 6.6 \times 10^{-34} \text{ joule-sec}$; $\epsilon_0 = 8.85 \times 10^{-12} \text{ farad/metre}$
19. a) Discuss the coupling schemes used in atoms having two or more electrons (OR)
b) A beam of electrons enter a uniform magnetic field of 1.2T. Calculate the energy difference between electrons whose spins are parallel and antiparallel to the field
20. a) Describe the microwave spectrometer with the help of a diagram (OR)
b) The rotational spectrum of HCl shows series of lines separated by 20.6 cm^{-1} . Find the moment of inertia and the internuclear distance
21. a) Explain the principle and working of ATR spectroscopy (OR)
b) In the near infrared spectrum of HCl molecule there is single intense band at 2885.9 cm^{-1} . Assume that it is due to the transition between vibrational levels, show that the force constant k is 480 N/m . Given $M_{\text{H}} = 1.68 \times 10^{-27} \text{ kg}$
22. a) Explain Raman effect on the basis of quantum theory (OR)
b) The exciting line in an experiment is 5460 \AA and the stokes line is at 5520 \AA . Find the wavelength of antistokes line

SECTION – D

Answer Any Three Questions:

(3 X 10 = 30 Marks)

23. Explain Davis and Goucher experiment to determine excitation and ionization potentials
24. Explain the quantum numbers associated with vector atom model
25. Describe the applications of microwave spectroscopy
26. If a diatomic molecule undergoes simple harmonic motion, prove that vibrational energy for absorption and emission are equal
27. Explain the rotational energy levels of a linear molecule and the rotational Raman spectrum arising from transitions between them
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Course Code: 06CT51

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B.Sc., Physics Degree (Semester) Examinations, November 2020

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

Course Title: SOLID STATE PHYSICS

Under CBCS and OBE – Credit 4

Time: **3** Hours

Max. Marks: **75**

Section - A

Answer ALL questions

10 X 1 =10 Marks

1. In a crystal if the primitives $a \neq b \neq c$ and interfacial angles $\alpha \neq \beta \neq \gamma \neq 90^\circ$, then it belongs to the system
a) tetragonal b) orthorhombic c) monoclinic d) triclinic
2. Miller indices of the plane parallel to x-axis and y-axis is
a) (100) b) (010) c) (001) d) (111)
3. A dislocation is
a) always under shear b) a two-dimensional defect c) a point defect d) always present in solids
4. In ionic crystals, missing of a pair of cation and anion results in
a) electronic defect b) Schottky defect c) Frenkel defect d) line defect
5. At normal temperatures, the polarizations which are independent of temperature are
a) electronic and ionic b) ionic and orientational c) orientational and space charge d) space charge and electronic
6. A material can be piezoelectric, pyroelectric or ferroelectric only if it exhibits
a) centrosymmetry b) non-centrosymmetry c) hysteresis d) inversion symmetry
7. When a diamagnetic material is placed inside an external magnetic field
a) induced magnetic dipoles act along the applied field direction
b) induced magnetic dipoles are opposite to the applied field direction
c) induced magnetic dipoles act perpendicular to the applied field direction
d) there will be not induced magnetic dipoles

8. The change in the dimension of a ferromagnetic materials when it is magnetized is known as
a) hysteresis loss b) magneton c) magnetostriction d) magnetic susceptibility
9. When a material becomes superconductor
a) the properties of lattice structure do not change
b) the properties of lattice structure do change
c) it becomes ferromagnetic in nature
d) magnetic property does not change
10. The term SQUIDS stand for
a) Superconducting Quantum Interference Devices b) Superconducting Quality Inter Devices c) Superconducting Quantum Interference Delivery d) Superconducting Quantum Intercom Devices

Section – B

Answer ANY FIVE questions

5 X 2 = 10 Marks

11. Mention the seven crystal systems in 3D
12. What are Miller indices?
13. Write down the expression for number of vacancies in elemental solids at any temperature
14. What is dielectric breakdown?
15. What is hysteresis?
16. Differentiate hard and soft magnetic materials.
17. What is Meissner effect?

Section – C

Answer ALL questions

5X 5= 25 Marks

18. a) Show that BCC crystals are closely packed than SC.
(OR)
b) A beam of X-rays is incident on a NaCl crystal with lattice spacing 0.282 nm. Calculate the wavelength of X-rays if the first order Bragg reflection takes place at a glancing angle of $8^\circ 35'$. Also calculate the maximum order of diffraction possible.
19. a) Distinguish between edge and screw dislocations and explain the role of Burger's vector.

(OR)

b) If the observed interionic distance is 2.82 \AA in a certain sample of sodium chloride, show that the average energy required for creation of one Schottky defect is 1.971 eV if the density of Schottky defect is $5 \times 10^{11} \text{ per m}^3$ at 25°C .

20. a) Explain ionic and orientational polarization.

(OR)

b) The following data refers to a dielectric material. $\epsilon_r = 4.94$ and $n^2 = 2.69$, where n is the index of refraction. Calculate the ratio between electronic and ionic polarizability for this material.

21. a) Explain the origin of magnetic moment. Find the magnetic dipole moments due to orbital motion of the electrons.

(OR)

b) The saturation magnetic induction of nickel is 0.65 wb/m^2 . If the density of nickel is 8906 kg/m^3 and its atomic weight is 58.7 , calculate the magnetic moment of the nickel atom in Bohr magneton.

22. a) Compare and contrast Type I and Type II superconductors

(OR)

b) The penetration depth for lead is 396 \AA and 1730 \AA at 3 K and 7.1 K , respectively. Calculate the critical temperature for lead.

Section – D

Answer ANY THREE questions

3 X 10 = 30 Marks

23. Obtain the c/a ratio for the hcp crystal structure and hence calculate the packing factor.
24. Derive an expression for the density of Frenkel defects in ionic crystals.
25. Obtain an expression for the internal field and hence derive Clausius-Mosotti relation.
26. Derive the expression for susceptibility as a function of temperature for paramagnetic materials.
27. Describe Josephson effects and their applications.

.



Course Code: 06CT52

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

Residential & Autonomous – A Gurukula Institute of Life-Training
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[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, November 2020

Part – III : Core Subject : Fifth Semester

Course Title: Digital Electronics

Under CBCS and OBE – Credit 4

Time: 3 Hours

Max. Marks: 75

SECTION – A

Answer ALL Questions:

(10 X 1 = 10 Marks)

- The binary number 1110 is equivalent to _____ decimal number
a) 13 b) 12 c) 14 d) 15
- Which number system has base 8?
a) decimal b) binary c) octal d) Hexadecimal
- 2's complement of binary number 11101 is
a) 10111 b) 00010 c) 00011 d) 00001
- How many AND, OR and EXOR gates are required for the configuration of full adder?
a) 1, 2, 2 b) 2, 1, 2 c) 3, 1, 2 d) 4, 0, 1
- In serial shifting method, data shifting occurs
a) One bit at a time b) simultaneously c) Two bit at a time d) Four bit at a time
- Ripple counters are also called
a) SSI counters b) Asynchronous counters c) Synchronous counters d) VLSI counters
- The modulation index is _____ to the modulating frequency
a) equal b) proportional c) inversely proportional d) directly proportional
- The unit of angular velocity is
a) m/s b) rad/sec c) Hz d) seconds
- Which bus is a unidirectional bus?
a) data bus b) address bus c) control bus d) I/O bus
- The number of status flags present in 8085 microprocessor are
a) 8 b) 16 c) 5 d) 2

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

- What is an inverter?
- Sketch the logic symbol for OR and Ex-OR gates.
- Add the two binary numbers 11010101 and 11010101.
- Write the formula for duty cycle to an astable multivibrator.
- What is a flip flop?
- List out the types of register.
- What is microprocessor?

SECTION – C

Answer ALL Questions:

(5 X 5 = 25 Marks)

18. a) Explain multiplexer in detail.

(OR)

b) Explain about two input and four input Exclusive OR gate with truth table.

19. a) Discuss briefly about half adder and full adder with relevant diagram.

(OR)

b) Show how to add 150_{10} and 85_{10} with unsigned 8 bit numbers.

20. a) Explain RS flip flop in detail.

(OR)

b) Explain JK Master Slave flip flop in detail.

21. a) Interpret the mathematical representation of frequency modulation.

(Or)

b) A 25 MHz carrier is modulated by a 400 Hz audio sine wave. If the carrier voltage is 4 V and the maximum deviation is 10 kHz, write the equation of this modulated waves for the FM and PM.

22. a) Classify the microprocessor 8085 instruction set.

(OR)

b) Write a microprocessor program to find one's complement of an 8 bit number

SECTION – D

Answer Any Three Questions:

(3 X 10 = 30 Marks)

23. Show how NAND gate and NOR gate called as universal logic gates

24. Demonstrate 555 timer acts as astable multivibrator with logic diagram.

25. Describe an asynchronous counter using negative edge triggered JK flip flop.

26. Explain the generation of frequency modulation by direct method.

27. Sketch the internal architecture of 8085 microprocessor and illustrate their operations in the processor.



Course Code: 06EP51

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B.Sc., Physics Degree (Semester) Examinations, November 2020

Part – III : Elective Subject : Fifth Semester : Paper – I

Course Title: OBJECT ORIENTED PROGRAMMING WITH C++

Under CBCS and OBE – Credit 5

Time: **3 Hours**

Max. Marks: **75**

SECTION – A

Answer ALL Questions:

(10 X 1 = 10 Marks)

1. contains function prototypes for the standard input and standard output functions.
a) <string.h> b) <iostream.h> c) <math.h> d) <conio.h>
2. C++ is a Programming language
a) Object oriented b) Procedure oriented c) Object based d) Procedure based
3. C++ provides various types of that includes keywords, identifiers, constants, strings and operators.
A) tokens B) expressions C) structures D) none
4. refer to the names of variables, functions, arrays, classes etc. created by programmer.
A) Keywords B) Identifiers C) Constants D) Strings
5. In C++, the declaration of functions and variables are collectively called
A) class members B) function members C) object members D) member variables
6. The keywords private and public used in C++ are known as
A) keyword labels B) visibility labels C) declaration labels D) display labels
7. C++ provides a special _____ called the constructor, which enables an object to initialize itself when it is created.
A) friend function B) member function C) public function D) private function
8. A constructor has the same _____ as that of class.
A) variable B) object C) function D) name
9. A derived class with only one base class is called _____ inheritance
a) single b) multilevel c) multiple d) hybrid
10. Default visibility mode is
a) public b) protected c) private d) both a and b

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

11. Define Object.
12. What do you mean by encapsulation?

13. What do you mean by call by reference?
14. Define inline function.
15. What is called parameterized constructor?
16. Define Operator overloading.
17. Define inheritance.

SECTION – C

Answer ALL Questions:

(5 X 5 = 25 Marks)

18. a) Explain about Structure of C++ program.
(OR)
b) Explain Scope resolution operator with example.
19. a) Explain about Basic data types with example.
(OR)
b) What is called function overloading? Explain with example.
20. a) How does C++ structure differ from C++ class?
(OR)
b) Explain friend function.
21. a) Explain constructors with its characteristics.
(OR)
b) List out any Five rules for overloading operators.
22. a) Distinguish between unary and binary operators.
(OR)
b) Discuss about Multilevel inheritance with suitable example.

SECTION – D

Answer Any Three Questions:

(3 X 10 = 30 Marks)

23. Write a program for temperature conversion (Celsius to Fahrenheit and Fahrenheit to Celsius) using if-else statement.
24. Write a program to find largest among two numbers using Nesting of member function.
25. Write a program for Binary to Decimal conversion.
26. Write a program using overloading unary minus operator.
27. Write a program to multiply two numbers using multiple inheritance.

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B.A./B.Sc./B.Com./B.Com.(CA) Degree (Semester) Examinations, November 2020

Max. Marks: **75**

- What is the time taken by the light of the Sun to reach on the Earth?
a) 8 Minute b) 9 Minute
c) 7 Minute 20 Second d) 8 Minute 18 Second
- Which planet in the Solar System has highest density?
a) Earth b) Uranus c) Neptune d) Jupiter
- The sun is ____ million km away from the earth.
a) 100 b) 150 c) 200 d) 250
- The diameter of Moon is _____ that of the earth.
a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{1}{4}$ d) $\frac{2}{3}$
- The moon moves around the earth in about _____ days.
a) 25 b) 26 c) 27 d) 28
- Which is the nearest planet to the sun?
a) Neptune b) Mars c) Mercury d) Earth
- On which planet the life exists?
a) Earth b) Moon c) Jupiter d) Mars
- In India, modulation is used for radio transmission
a) Frequency b) Amplitude c) Phase d) None of the above
- In radio transmission, the medium of transmission is
a) Space b) An antenna c) Cable d) None of the above
- The major advantage of FM over AM is
a) Reception is less noisy b) Higher carrier frequency
c) Smaller bandwidth d) Small frequency deviation

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

11. Why Earth appears blue from space?
12. How many planets are there in our solar system?
13. What is the direction of rotation of earth on its axis?
14. Why is Venus called the Veiled planet?
15. Do stars emit light only during night time?
16. Name the unit which is used to measure astronomical distances?
17. What is artificial satellite? Give one example.

SECTION – C

Answer ALL Questions:

(3 X 9 = 27 Marks)

18. a) What is the solar system? Explain.
(OR)
b) What makes life possible on planet Earth?
19. a) Explain why we see phases of moon.
(OR)
b) Differentiate Star and the planet
20. a) Distinguish between Meteoroid and Comet
(OR)
b) Give the types of satellite services.

SECTION – D

Answer Any Two Questions:

(2 X 14 = 28 Marks)

21. Explain about every planet of the solar system.
22. Describe the Green house effect on Venus.
23. What do you know about Black Holes? Explain.
24. Explain about Geostationary Satellite.



SECTION – A

Answer ALL Questions:

(10 X 1 = 10 Marks)

1. The most common gas used in collectors is
 - a) CO₂
 - b) NO₂
 - c) air
 - d) CO
2. Which of the following scientist devised solar furnace composed of a paraboloidal concentrator and a lens?
 - a) Lavoisier
 - b) M.K.Ghosh
 - c) Strauble
 - d) Trombe
3. The overall dimensions of liquid flat plat collectors was
 - a) 2m x 1m x 1 cm
 - b) 2m x 1m x 1 m
 - c) 2m x 1m x 15 cm
 - d) 2m x 2m x 15cm
4. The concentrating ratio CR =
 - a) Aa /Ar
 - b) Ar /Aa
 - c) As /Ar
 - d) Ad /Ar
5. The instrument is used to measure the duration in hours of bright sunshine during the course of the day is
 - a) Pyranometer
 - b) Sunshine recorder
 - c) Eppley Pyranometer
 - d) Yellot Solarimeter
6. The radiation absorbed by the plate reduced by a factor of (1-d) where d is
 - a) 0.02
 - b) 0.002
 - c) 0.20
 - d) 2.00
7. Which of the following plate should have high thermal conductivity an adequate tensile strength?
 - a) Absorber plate
 - b) enclosure
 - c) insulation
 - d) flow passage
8. In a solar collector, why is the transparent cover providing for?
 - a) Protect the collector from dust.
 - b) Reduce the heat losses from collector beneath to atmosphere.
 - c) Transmit solar radiation only
 - d) All of the above
9. Global radiation =
 - a) Direct radiation – Diffuse Radiation
 - b) Direct radiation + Diffuse Radiation
 - c) Direct radiation / Diffuse Radiation
 - d) Diffuse Radiation / Direct radiation
10. The first solar cooker was developed by
 - a) Mr.M.K.Gandhi
 - b) Mr.K.M.Bhosh
 - c) Mr.M.K.Ghosh
 - d) Mr.G.K.Bush

SECTION – B

Answer Any Five Questions:

(5 X 2 = 10 Marks)

11. What are the five main components of flat plate collectors?
12. List out the different solar energy measuring equipments
13. What is a Solar collector?
14. What is a focusing collector?
15. What is solar cell?
16. Write down about the effect of dust and shading factor.
17. Write about the PV technology in India

SECTION – C

Answer ALL Questions:

(3 X 9 = 27 Marks)

18. a) Explain Sunshine recorder in detail.

(OR)

- b) Illustrate some possible configurations of solar concentrators and receivers

19. a) Discuss briefly about solar furnace in detail.

(OR)

- b) Illustrate the Box type solar cooker with neat diagram

20. a) Explain the structure of the sun.

(OR)

- b) Discuss about the advantages and disadvantages of solar photovoltaic energy conversion.

SECTION – D

Answer Any Three Questions:

(2 X 14 = 28 Marks)

21. Explain about the selection materials for flat plate collectors
22. Discuss briefly about the typical liquid and air collector with neat diagram
23. Describe briefly about Pyranometer with suitable diagram.
24. Discuss briefly about the applications of solar energy in space.



Course Code: 06SB51

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B.Sc. Physics Degree (Semester) Examinations, November 2020

Part – IV : SBS : Fifth Semester

Course Title: Fibre Optic Communication

Under CBCS – Credit 2

Time: **2 Hours**

Max. Marks: **75**

Section - A

Answer ALL questions

10 X 1 =10 Marks

1. The working principle of an optical fibre is
a) reflection b) refraction c) total internal reflection d) polarization
2. The light propagation in an optical fibre will effectively happen only when
a) refractive index of core is greater than cladding b) refractive index of core is less than cladding c) refractive index of both core and cladding are equal d) all of the above
3. Loss in fibre does not happen due to
a) impurities b) microbending c) attenuation in fibre d) stepped index operation
4. A graded index profile in optical fibre cable provides
a) less waveguide dispersion than SI profile b) less material dispersion than SI profile c) less attenuation than SI profile d) less modal dispersion than SI profile
5. Bandwidth of phototransistor is about
a) 4 MHz b) 400 MHz c) 400 kHz d) 40 kHz
6. The mechanism behind the light emission of a laser source is
a) spontaneous emission b) population inversion c) stimulated emission d) stimulated emission and population inversion
7. In the fabrication of optical fibre silica is used because
a) it is cheap and easily available b) it is obtained in abundance c) it is obtained in purest form d) processing it is easier
8. Source of light for optical fibre is
a) PIN diode b) Photo diode c) phototransistor d) LED
9. The colour of LED can be changed by

a) using different bandgap semiconductor b) by changing the doping level of the semiconductor c) by increasing applied voltage d) by increasing applied current

10. Function of receiver in optical fibre is to

a) reshape the degraded signal only b) only amplify the degraded signal c) both amplify and reshape the degraded signal d) retrieve the signal

Section – B

Answer ANY FIVE questions

5 X 2 = 10 Marks

11. How an optical characteristic of a material is determined?
12. Enumerate three broad classes of optical fibres.
13. What is transit time dispersion?
14. List any two characteristics of plastic fibres.
15. What are the advantages of multi-element glasses?
16. Draw the equivalent circuit of a PN junction photo detector.
17. Enlist the two different classes of optical fibre transmitters.

Section – C

Answer ALL questions

3X 9= 27 Marks

18. a) (i) Compute the NA, acceptance angle, and the critical angle of the fibre having core refractive index 1.50 and clad refractive index 1.45.
(ii) Calculate the refractive indices of the core and cladding material of a fibre from the following data: $NA = 0.22$ and $\Delta = 0.012$.

(OR)

b) Explain the working principle of stepped index fibre.

19. a) Describe with suitable sketch the external CVD technique.

(OR)

b) Explain the working principle of a semiconductor laser diode.

20. a) (i) Calculate the efficiency of a PIN silicon photo-detector if the responsivity is 0.58 A/W at 800 nm.
(ii) Calculate the 3-dB bandwidth and the resistor that can be used without significantly increasing the rise time. The PIN diode has a capacitance of 5 pF and a transit-time limited rise time of 2 ns.

(OR)

b) Elucidate the important applications of integrated optic fibre technology.

Section – D

Answer ANY TWO questions

2 X 14 =28 Marks

21. Derive the expression of acceptance angle and numerical aperture of an optical fibre.
22. Explain with suitable diagrams various internal CVD techniques.
23. Elucidate the working principle of PIN photo diode and Avalanche Photo-diode.
24. Explain with necessary diagram the working principle of various fibre optic receivers.



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B.A/B.Sc Degree (Semester) Examinations November 2020

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

ARMED FORCES AND NATIONAL INTEGRATION

Under CBCS – Credit 2

Time: 2Hours

Maximum Marks:75

SECTION – A

ANSWER ALL QUESTIONS

10 X 1 =10 Marks

- OTA located at
a) Gwalior b) Kamptee c) Chennai d) Delhi
- The Kunzru's committee formed in the year of
a) 1947 b) 1948 c) 1950 d) 1946
- Government of India act passed in the year
a) 1935 b) 1947 c) 1950 d) 1938
- The national games of India is
a) Hockey b) cricket c) foot ball d) kabaddi
- There are ____ bones in human body
a) 206 b) 202 c) 304 d) 218
- National Defence Academy (NDA) is located at _____.
a) Dehradun b) Pune c) Mumbai d) Chennai
- The Army day of India is _____.
a) Jan 15 b) Sep 05 c) Jun 21 d) last Sunday of November
- The study of disease is called
a) Pathology b) ecology c) virology d) fungi
- The International Yoga day was celebrated on
a) Jun 05 b) June 21 c) Aug 15 d) Jan 26
- Periyar Wild Life sanctuary is located in
a) Kerala b) Tamilnadu c) Andrapradesh d) Karnataka

SECTION – B

ANSWER any FIVE QUESTIONS

5 X 2 =10 Marks

- State the motto of NCC
- Expand the terms: NIC and AAC
- Name any two wars of Independence
- What is Vijay Diwas?

15. Who is an autocratic leader?

16. What is Ethics?

17. What is pollution?

SECTION – C

ANSWER ALL QUESTIONS

3 X 9=27 Marks

18. a) What are the Cardinal points of NCC ?

(OR)

b) Write the aims of NCC.

19. a) Give the basic qualities of a leader

(OR)

b) What are the fundamental duties of the Indian Citizens?

20. a) Explain the preventive measures for dengue?

(OR)

b) Write a note on national integration.

SECTION – D

ANSWER any TWO QUESTIONS

2 X 14 = 28 Marks

21. Draw and explain the flow chart of NCC administration.

22. Explain the air pollution and water pollution

23. What are the problems and challenges of national integration?

24. Describe the rain water harvesting.

