



VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Maths/Chem Degree (Semester) Examinations, November 2018

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

ALLIED PHYSICS – I

Under CBCS – Credit 4

Time: **3** Hours

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(10 × 1 = 10)

- The term SONAR stands for ____
 a) Sky Navigation and Ranging b) Sound Navigation and Ranging
 c) Sound Noise Ratio d) Sound Air Ratio
- The differential equation representing the S.H.M of a particle is $\frac{d^2y}{dt^2} + \omega^2y = 0$. The natural frequency of the particle is then given by
 a) ω b) $2\pi/\omega$ c) $\omega/2\pi$ d) $2\pi\omega$
- The SI unit of surface tension is ____
 a) Nm^{-2} b) Nm^{-1} c) Nm d) Cm
- The bending moment produced in a beam depends upon
 a) Young's modulus of the beam
 b) Geometric moment of inertia of the cross section of the beam
 c) Radius of curvature of the neutral axis
 d) All of the above
- The total gain in entropy of the working substance in a Carnot's cycle is
 a) Zero b) negative c) positive d) none of the above
- Out of the following, the physical quantity that relates with first law of thermodynamics is
 a) temperature b) pressure c) Energy d) number of moles
- A capacitor is a device for storing
 a) current b) voltage c) magnetic field d) charge

8. The magnetic induction (B) at the centre of the coil, $r = 0$ is
 a) $\mu_0 Ni / 3a$ b) $\mu_0 Ni / 2a$ c) $\mu_0 Ni / a$ d) $\mu_0 Ni / 5a$
9. The angle of incidence for which the angle of refraction is 90° is called the
 a) normal angle b) reflected angle
 c) critical angle d) refracted angle
10. The Abbe sine condition is
 a) $n_1 h_1 \cos \theta_1 = n_2 h_2 \cos \theta_2$ b) $n_1 h_1 \sin \theta_1 = n_2 h_2 \sin \theta_2$
 c) $n_1 h_1 \cos \theta_1 = n_2 h_2 \sin \theta_2$ d) $n_1 h_1 \sin \theta_1 = n_2 h_2 \cos \theta_2$

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

11. What are ultrasonic waves?
12. Define streamline motion.
13. Define entropy.
14. State Maxwell's cork screw rule.
15. Define critical angle.
16. What is meant by reverberation?
17. Define surface tension. State its unit.

SECTION – C

Answer ALL Questions :

(5 × 5 = 25)

18. a) Give the uses of ultrasonic waves.

(OR)

- b) The volume of a room is $600m^3$. The wall area of the room is $220m^2$, the floor area is $120m^2$ and the ceiling area is $120m^2$.

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 moment of a beam.

(OR)

- b) Calculate the work done in stretching a uniform metal wire of area of cross-section $10^{-6}m^2$ and length $1.5m$ through $4 \times 10^{-3}m$. Given, $E = 2 \times 10^{11} Nm^{-2}$.

20. a) Explain the change of entropy in a reversible process.

(OR)

- b) Find the efficiency of the Carnot's engine working between the steam point and the ice point?

21. a) What is a switch? Explain the various types of switches.

(OR)

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

22. a) Explain about direct vision spectroscopy with neat diagram.

(OR)

- b) The dispersive powers for crown and flint glass are 0.015 and 0.030 respectively. Calculate the focal lengths of the lenses (made of crown and flint glass) which form an achromatic doublet of focal length 60 cm when placed in contact..

SECTION – D

Answer any THREE Questions :

(3 × 10 = 30)

23. Discuss, with necessary theory, the composition of two simple harmonic motions of equal time periods at right angles to each other. Discuss the different important cases.
24. Define coefficient of viscosity. Derive Poiseuille's formula for the rate of flow of a liquid through a capillary tube.
25. i) State and explain the second law of thermodynamics.
ii) State and explain the third law of thermodynamics.
26. State Biot-savart law. Calculate the magnetic induction due to current in a circular coil of wire at a point on its axis.
27. Explain what is meant by chromatic aberration in lenses. Derive the condition for achromatism of two thin lenses separated by a finite distance.





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B.Sc. Physics Degree (Semester) Examinations, November 2018

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

MECHANICS

Under CBCS – Credit 4

Time: **3** Hours

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(10 × 1 = 10)

1. Which one is a vector?
a) Length b) Volume c) Velocity d) Work
2. When velocity time graph is a straight line parallel to time axis then:
a) Acceleration is constant b) Acceleration is variable
c) Acceleration is zero d) Velocity is zero
3. A football player will throw a football at maximum distance if the angle of projection is:
a) 30° b) 45° c) 60° d) 90°
4. A particle is moving in a circle with constant speed. The direction of centripetal force will be:
a) Along the tangent b) Along radius towards center
c) Along radius away from center d) Changing with motion
5. The center of mass of Earth's atmosphere is:
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
6. If the total momentum of a system is changing:
a) particles of the system must be exerting forces on each other
b) the system must be under the influence of gravity
c) the center of mass must have constant velocity
d) a net external force must be acting on the system

7. The time rate of change of linear momentum of a particle is the net _____ acting on the particle
 a) moment b) velocity c) torque d) force
8. Which among the following is a vector quantity?
 a) work b) power
 c) kinetic energy d) none of the above
9. The ratio of mass to volume of a given object is called _____
 a) pressure b) density c) force d) energy
10. SI unit of pressure is
 a) N/m^2 b) N/m c) N-m d) N/m^3

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

11. What do you infer from Newton's third law?
12. In projectile motion, what happens to acceleration and velocity in the absence of air resistance?
13. State law of conservation of momentum.
14. How angular momentum and angular velocity is related?
15. State work-energy theorem.
16. What is bulk modulus?
17. What is absolute pressure?

SECTION – C

Answer ALL Questions :

(5 × 5 = 25)

18. a) What is free fall? How do you modify the equations of motion for freely falling bodies?

(OR)

- b) An alpha particle (the nucleus of a helium atom) travels along the

inside of an evacuated straight tube 2.0 m long that forms part of a particle accelerator. The alpha particle enters the tube (at $t = 0$) moving at the velocity $9.5 \times 10^5 \text{ m/s}$ and emerges from the other end at time $t = 8.0 \times 10^{-7} \text{ s}$.

i) If the particle's acceleration is constant, what is the acceleration?

ii) What is its velocity when it leaves the tube?

19. a) Derive an expression for rotational speed of a rotor necessary to prevent falling.

(OR)

- b) A satellite of mass 1250 kg is to be placed in a circular orbit at a height $h = 210 \text{ km}$ above the Earth's surface, where $g = 9.2 \text{ m/s}^2$.

i) What is the weight of the satellite at this altitude?

ii) With what tangential speed must it be inserted into its orbit? The Earth's radius is $R = 6370 \text{ km}$.

20. a) State and explain "Law of conservation of Linear Momentum".

(OR)

- b) A glider of mass $m_1 = 1.25 \text{ kg}$ moves with a velocity of 3.62 m/s on a frictionless, level air track and collides with a second glider of mass $m_2 = 2.30 \text{ kg}$ that is initially at rest.

After the collision, the first glider is found to be moving at 1.07 m/s in a direction opposite to that of its initial motion. What is the velocity of m_2 after the collision?

21. a) Derive the relation between torque and angular momentum for a system of particles.

(OR)

- b) A 120-kg astronaut, carrying out a "space walk," is tethered to a spaceship by a fully extended cord 180 m long. An unintended

operation of the propellant pack causes the astronaut to acquire a small tangential velocity of 2.5 m/s. To return to the spacecraft, the astronaut begins pulling along the tether at a slow and constant rate. With what force must the astronaut pull at distance of

i) 50 m and

ii) 5 m from the spacecraft? What will be the astronaut's tangential speed at these points?

22. a) Using mercury barometer, measure the atmospheric pressure.

(OR)

b) A storage tower of height $h = 32$ m and diameter $D = 3.0$ m supplies water to a house. A horizontal pipe at the base of the tower has a diameter $d = 2.54$ cm. to satisfy the needs of the home, the supply pipe must be able to deliver water at a rate $R = 0.0025 \frac{m^3}{s}$. If water were flowing at the maximum rate, what would the pressure in the horizontal pipe.

SECTION – D

Answer any THREE Questions :

(3 × 10 = 30)

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





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B.Sc. Physics Degree (Semester) Examinations, November 2018

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

ELECTROMAGNETISM

Under CBCS – Credit 4

Time: **3 Hours**

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(10 × 1 = 10)

1. The Unit of dipole moment is
 a) C-m b) C/m c) C m² d) C m⁻²
2. The SI unit of charge is _____
 a) Ohm b) Farad c) Volt d) Coulomb
3. Farad is a unit of
 a) Self inductance b) Capacitance
 c) mutual inductance d) conductance
4. The Guard ring used in a Parallel plate capacitor is
 a) to increase the capacity b) to decrease the capacity
 c) to avoid edge effect d) to decrease the energy loss
5. The unit of electrical conductivity is _____
 a) Weber/m b) ohm/m c) mho/m d) newton/m
6. A transformer transforms
 a) voltage b) current c) power d) frequency
7. 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
8. Magnetic moment is a
 a) pole strength b) universal constant
 c) scalar quantity d) vector quantity
9. Q factor of the coil is measure of its
 a) Mutual inductance b) self inductance
 c) retentivity d) selectivity
10. The sharpness of peak depends upon the _____ of the circuit
 a) Capacitance C b) Resistance R
 c) Inductance L d) all of the above

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

11. State Coulomb's Law.
12. Define potential difference.
13. What is current density? Get the expression for it.
14. State Biot and Savart's Law.
15. What are Choke Coil.
16. Write short note on Q-Factor.
17. Define Charge sensitiveness of a moving coil galvanometer.

SECTION – C

Answer ALL Questions :

(5 × 5 = 25)

18. a) Derive an expression for electric field at a point on the 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?
19. a) Derive the relation between electric field at a point and electric potential.
(OR)
b) An isolated metal sphere whose diameter is $10cm$ has potential difference of $8000 Volts$. What is the energy density at the surface of the sphere?
20. a) Explain the equation of continuity.
(OR)
b) A Copper wire of diameter $0.5mm$ and length $20m$ is connected across a battery of emf $1.5V$ and internal resistance 1.25Ω . 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 meter of the wire?

21. a) Calculate Magnetic induction due to a current in a circular coil of wire at a point on its axis.

(OR)

- b) A Capacitor charged upto $2volts$ is discharged through a ballistic galvanometer having time period of 12 seconds and current sensitivity $2.2 \times 10^{-8} \frac{amp}{cm}$. If the first and eleventh throws of galvanometer are $9.6cm$ and $8cm$ respectively. Calculate the Capacitance of Capacitor.
22. a) Describe about three phase A.C. generator.
(OR)
b) A circuit of a non – inductive resistance of 50Ω , an inductance of 0.3 henry and a resistance of 2Ω and a capacitor of $40\mu F$ in series and is supplied with $200V$ at $50Hz$. Find the impedance, the current lag or lead and the power in the circuit.

SECTION – D

Answer any THREE Questions :

(3 × 10 = 30)

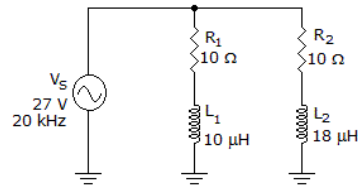
23. State the Gauss' law and derive an expression for electric field due to a uniformly charged sphere.
24. a) Derive the expression for the capacity of a parallel plate capacitor.
b) Derive the expression for the capacitors connected in series and parallel.
25. Describe the experimental method for estimating the temperature coefficient of resistance using careyfooster bridge.
26. Give the theory of moving coil ballistic galvanometer.
27. Obtain an expression for current in an LCR series AC circuit. Discuss the salient features of the circuit.



Answer ALL Questions :

- Two resistors having values 5 ohms and 10 ohms are connected in series to a 10 V source. Find the current flowing through the circuit
 - 0.66 A
 - 1.5 A
 - 2 A
 - 2.5 A
- According to Millman's Theorem, if there are n current sources with n internal conductances respectively, are in series, then these sources are replaced by?
 - single voltage source V' in parallel with G'
 - single current source I' in series with G'
 - single current source I' in parallel with G'
 - single voltage source V' in series with G'
- A phasor represents
 - the magnitude of the quantity
 - the magnitude and direction of a quantity
 - the phase angle
 - the length of a quantity
- What is the correct expression of ω ?
 - $\omega=2\pi$
 - $\omega=2 \pi f$
 - $\omega= \pi f$
 - $\omega=2f^2$
- What is the phase angle for a parallel circuit consisting of a 500 kHz, 5 Vac source with a 47 pF capacitor, and a 4.7 k Ω resistor in parallel?
 - 55.3°
 - 55.3°
 - 34.8°
 - 34.8°
- When the frequency of the source voltage decreases, the impedance of a parallel RC circuit
 - increases
 - does not increases
 - decreases
 - decreases to zero

7. The voltage dropped across R_1 in the given circuit



- a) 14 V b) 26.8 V c) 28 V d) 0 V
8. If a load is purely inductive and the reactive power is 12 VAR, the apparent power is
a) 12 V b) 0 V c) 6 V d) 24 V
9. What is the Q (Quality factor) of a series circuit that resonates at 6 kHz, has equal reactance of 4 kilo-ohms each, and a resistor value of 50 ohms?
a) 0.001 b) 50 c) 80 d) 4.0
10. What would be the power factor for an RLC circuit that acts inductively?
a) +90 degrees leading b) one
c) zero d) -90 degrees lagging.

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

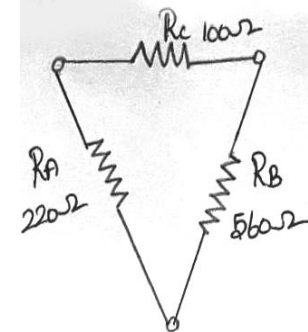
11. Describe the term circuit ground.
12. Give the phasor representation of sine wave.
13. What is impedance? Write the expression for impedance in a series RC circuit.
14. Write a short note on sinusoidal response of RL circuits.
15. State superposition theorem.
16. Define maximum power transfer theorem.
17. Depict the waveform showing relationship of current & voltage in a series RC circuit.

SECTION – C

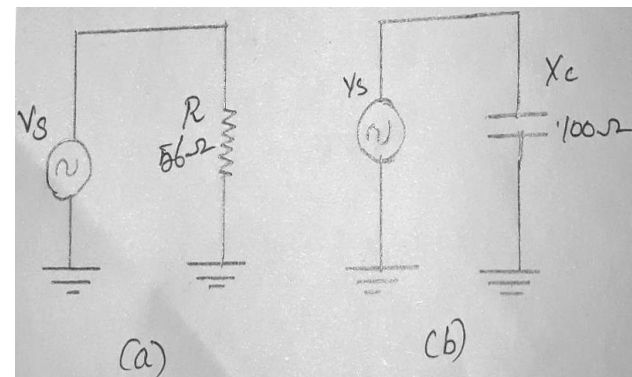
Answer ALL Questions :

(5 × 5 = 25)

18. a) Illustrate in detail about voltage source.
(OR)
b) Convert the given delta circuit wye circuit.



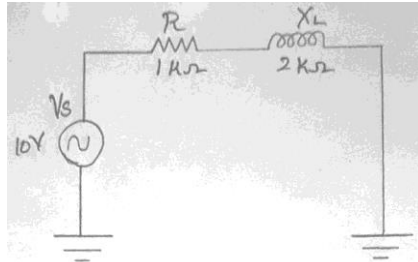
19. a) Discuss about rectangular and polar wave forms of complex numbers.
(OR)
b) Convert the following complex numbers from rectangular form to polar form by determining magnitude & angle.
i) $8 + j6$ ii) $10 - j5$
20. a) Elucidate the sinusoidal response of RC circuits.
(OR)
b) For each circuit given below write for phasor expression for impedance in both rectangular and polar form.



21.a) Provide an elaborate theory of relationship of current and voltage in a series RL circuit.

(OR)

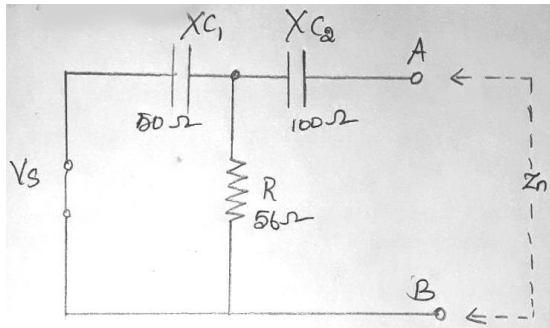
b) Determine the power factor, the true power & reactive power for the circuit given below.



22.a) State and explain Millman's theorem.

(OR)

b) Find Norton's equivalent impedance z_n for the circuit given below viewed from open across terminals A and B .



SECTION – D

Answer any THREE Questions :

$(3 \times 10 = 30)$

23. Elaborately explain thevenin's theorem.
24. Give a detailed note on pulse waveform and triangular waveform.
25. Discuss in detail about pulse response of RC circuits.
26. Describe the action of RL circuit as lowpass and highpass filter.
27. Present a detailed view on filter response characteristics.





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B.Sc. Physics Degree (Semester) Examinations, November 2018

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

SPECTROSCOPY

Under CBCS – Credit 5

Time: **3** Hours

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(10 × 1 = 10)

- According to Bohr atom model, angular momentum L of the electron
 $L =$ _____
 a) $h / 2\pi$ b) $nh / 2\pi$ c) $n / 2\pi$ d) $nh\pi$
- In Franck and Hertz's method _____ vapour is filled in the tube.
 a) sodium b) mercury c) helium d) neon
- Angular velocity $\omega =$ _____.
 a) $Be / 3m$ b) $Be / 2m$ c) $Be / 4m$ d) Be / m
- Zeeman Shift $\delta \lambda =$ _____.
 a) $\pm Be\lambda / 4\pi mc$ b) $\pm Be\lambda^2 / 4\pi mc$
 c) $\pm Be\lambda^3 / 4\pi mc$ d) $\pm Be\lambda^2 / 2\pi mc$
- Which among the following is 'microwave active'?
 a) Cl_2 b) H_2 c) CH_3Cl d) all the above
- $O\ C\ O$ is microwave inactive due to the absence of _____.
 a) rotational spectrum b) vibrational spectrum
 c) dipole moment d) band spectrum
- 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
- Rotatable prisms of infrared spectrometer are made of _____.
 a) Potassium Chloride b) Sodium Chloride or Potassium Bromide
 c) Sodium Bromide d) Potassium Sulphide

9. Which of the molecules given below have spherical polarizability surfaces which are completely isotropic?

- a) Methane b) Carbon tetrachloride
c) Silicon tetrahydride d) All the above

10. Symmetric top molecules, because of their axial symmetry have polarizability ellipsoids similar to _____.

- a) spherical top molecules b) cylindrical top molecules
c) non-linear molecules d) linear molecules

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

11. State correspondence principle.
12. What do you mean by alkali spectra?
13. Give the reason for magnetic moments of atoms.
14. Write down the formula for Lande g factor.
15. Why OCO (CO₂) is microwave inactive?
16. How energy of a vibrating diatomic molecule executing SHO is expressed?
17. Why lasers are preferred as ideal sources in Raman spectrometers?

SECTION – C

Answer ALL Questions :

(5 × 5 = 25)

18. a) List out the concepts which favour Bohr's theory.

(OR)

- b) Calculate a) ionisation potential
 b) first excitation potential of hydrogen atom.

Given $h = 6.626 \times 10^{-34} \text{ Js}$, $e = 1.6 \times 10^{-19} \text{ C}$ and $m = 9.1 \times 10^{-31} \text{ kg}$.

19. a) What is the significance of spin-orbit coupling?

(OR)

- b) The red line of cadmium splits into three components separated by 120 MHz, when the source is placed in a magnetic field of flux

density 8.6mT, the light being examined in a direction perpendicular to the magnetic field. Calculate the ratio of charge to mass (e/m) of the electron.

20. a) Classify the molecules on the basis of their principal moments of inertia.

(OR)

- b) What are the degeneracies of the following diatomic rotational energy levels? a) 0 b) $\frac{h^2}{4\pi^2 I}$ c) $6\frac{h^2}{4\pi^2 I}$ where I = Moments of inertia.

21. a) Explain the principal and working of ATR spectroscopy.

(OR)

- b) The fundamental band for CO is centred at 2143.3 cm^{-1} and first overtone at 4259.7 cm^{-1} . Calculate $\bar{\nu}_e$ and $\bar{\nu}_e x_e$.

22. a) Define Rayleigh scattering and Raman scattering. Explain Raman Effect on the basis of quantum theory.

(OR)

- b) The rotational Raman spectrum of H₂ gas is found to consist of a series of stokes and antistokes lines the first of which appears at 3459 cm^{-1} relative to the source of excitation. Calculate the bond distance of H₂.

SECTION – D

Answer any THREE Questions :

(3 × 10 = 30)

23. Calculate the total energy of the electron. Explain spectral series of hydrogen with energy level diagram.

24. What is Zeeman Effect? Derive the expression for Zeeman Shift?

25. Describe the application of microwave spectroscopy.

26. If a diatomic molecule undergoes simple harmonic motion, Prove that vibrational energy for absorption and emission are equal.

27. Discuss the rotational energy levels of a linear molecule and the rotation Raman spectrum arising from transitions between them.





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B.Sc. Physics Degree (Semester) Examinations, November 2018

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

SOLID STATE PHYSICS

Under CBCS – Credit 5

Time: **3** Hours

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(10 × 1 = 10)

- The effective number of atoms belonging to the unit cell of BCC structure is
a) 8 b) 1 c) 2 d) 9
- Miller indices of the plane parallel to x-axis and y-axis is
a) (100) b) (010) c) (001) d) (111)
- Point defects influence
a) electrical properties b) mechanical properties
c) optical properties d) all the above
- In edge dislocation Burgers vector is _____ to the dislocation line.
a) parallel b) perpendicular
c) at any orientation with respect d) none of the above
- At 10^2 Hz frequency range
a) only space charge polarization exists
b) only electronic polarization exists
c) both ionic and orientation polarizations exist
d) all the polarization processes exist
- Specific heat is nothing but the heat capacity per unit _____ of a substance.
a) mass b) weight c) volume d) density

7. The temperature at which the transition of antiferro to para magnetism takes place is called
 - a) Curie-Weiss temperature
 - b) Curie temperature
 - c) Debye temperature
 - d) Neel temperature
8. The magnetization retained by the specimen when the magnetizing field is reduced from saturation value to zero is known as
 - a) coercivity
 - b) hysteresis
 - c) retentivity
 - d) spontaneous magnetisation
9. In superconducting state the energy gap
 - a) is large compared to semiconductors and insulators
 - b) is zero
 - c) is very small as compared to semiconductors and insulators
 - d) does not change
10. The correlation of wave function of super electrons on both sides of a thin insulating layer sandwiched between two superconductors is known as
 - a) Meissner effect
 - b) London effect
 - c) Isotope effect
 - d) Josephson effect

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

11. Define primitive cell.
12. What is Schottky defect?
13. Define dielectric constant.
14. What is Bohr magneton?
15. What are ferromagnetic materials?
16. Write a note on Type I super conductor.
17. Define Cooper pair?

SECTION – C

Answer ALL Questions :

(5 × 5 = 25)

18. a) Describe the simple cubic structure with diagram.
(OR)
b) Find the maximum radius of the interstitial sphere that can fit into the void at ($\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$) between the atoms in the body centered cubic structure.
19. a) Explain the edge dislocation with diagram.
(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.
20. a) Derive Clausius –Mosotti relation.
(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) Discuss in detail antiferromagnetic material.
(OR)
b) A paramagnetic material has a magnetic field intensity of 10^4 A/m. If the susceptibility of the material at room temperature is 3.7×10^{-3} , calculate the magnetization and flux density in the material.
22. a) Explain in detail first and second London equations.

(OR)

- b) Calculate the critical current for a wire of lead having a diameter of 1 mm at 4.2 K. The critical temperature for lead is 7.18 K and $H_0 = 6.5 \times 10^4$ A/m.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Describe the seven crystal systems with diagrams.
24. Explain the Bragg's X-ray spectrometer method of determination of lattice parameters.
25. Obtain an expression for the electronic polarizability in terms of the radius of the atom.
26. Explain the Langevin theory of diamagnetism.
27. Discuss in detail D.C and A.C Josephson effect. Discuss it's Applications.





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B.Sc. Physics Degree (Semester) Examinations, November 2018

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

DIGITAL ELECTRONICS

Under CBCS – Credit 5

Time: **3 Hours**

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(10 × 1 = 10)

- It is desired to display the digit 7 using a seven segment display. The LEDs to be turned on are
a) a,b,c b) b,c,d c) c,d,e d) a,b,d
- Which of the following gate has a high output when an odd number of inputs is high?
a) OR gate b) NOR gate c) Ex-OR gate d) NAND gate
- A monostable multivibrator has _____.
a) one stable state b) two stable states
c) no stable state d) none of the above
- 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
- A shift register is defined as
a) The register capable of shifting an information to another register
b) The register capable of shifting an information either to the right or to the left
c) The register capable of shifting an information to the right only
d) The register capable of shifting an information to the left only
- A basic S-R flip-flop can be constructed by cross-coupling of which basic logic gates?
a) AND or OR gates b) XOR or XNOR gates
c) NOR or NAND gates d) AND or NOR gates

7. Pre emphasis is done
 - a) For boosting of modulating signal voltage
 - b) For modulating signals at higher frequencies
 - c) In FM before modulation
 - d) All of the above
8. Obtaining of frequency modulation from phase modulation is called
 - a) Armstrong system
 - b) Amplitude modulation
 - c) Phase modulation
 - d) frequency modulation
9. 8085 microprocessor has how many pins
 - a) 30
 - b) 20
 - c) 40
 - d) 14
10. 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 × 2 = 10)

11. What is an inverter?
12. Sketch the logic symbol for OR and Ex-OR gates.
13. What is the 2's complement representation of 1101 0110?
14. Write the formula for duty cycle to an Astable multivibrator.
15. Define flip flop.
16. What is Pre-emphasis?
17. What is microprocessor?

SECTION – C

Answer ALL Questions :

(5 × 5 = 25)

18. a) Explain multiplexer in detail.

(OR)

- b) i) Convert binary 110.001 to a decimal number.
- ii) Convert octal 3574 to binary number.

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) Find the analog output voltage from 5 bit ladder that has a digital input of 11010 and 11111. Assume that 0 = 0V and 1 = 10V.

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 × 10 = 30)

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.



Answer ALL Questions :

(10 × 1 = 10)

- The insulation of the data from direct access by the program is called _____.
a) data hiding b) data abstraction
c) encapsulation d) polymorphism
- _____ means that the code associated with a given procedure call is not known until the time of the call at run-time
a) Message passing b) Dynamic binding
c) Data hiding d) Data abstraction
- The _____ data type was used to specify the return type of a function when it is not returning any value.
a) int b) float c) void d) double
- Variable that are listed in function's calls are called
a) Actual parameter b) Declared parameter
c) Passed parameter d) None of them
- Which of the following statements about the member functions are True or False.
i) A member function can call another member function directly with using the dot operator.
ii) Member function can access the private data of the class.
a) i-True, ii-True b) i-False, ii-True
c) i-True, ii-False d) i-True, ii-True
- While using an object as a function argument, a copy of the entire object is passed to the function in _____ method.
a) pass-by-value b) pass-by-reference
c) pass-by-variable d) pass-by-function

7. The constructors that can take arguments are called ____ constructors.
a) default constructor b) parameterized constructor
c) implicit constructor d) argument constructor
8. Which of the following is the correct order involves in the process of operator overloading.
i) Define the operator function to implement the required operations.
ii) Create a class that defines the data type that is to be used in the overloading operation.
iii) Declare the operator function op() in the public part of the class.
a) 1-i, 2-ii, 3-iii b) 1-ii, 2-iii, 3-i c) 1-ii, 2-i, 2-iii d) 1-iii, 2-ii, 3-i
9. Which among the following best defines single level inheritance?
a) A class inheriting a derived class
b) A class inheriting a base class
c) A class inheriting a nested class
d) A class which gets inherited by 2 classes
10. Which of the following advantages we lose by using multiple inheritance?
a) Dynamic binding b) Polymorphism
c) Both Dynamic binding & Polymorphism d) None of the mentioned

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. Give any two striking features of object oriented programming.
12. Give any one example for user – defined data types.
13. Explain about call by Reference.
14. What do you mean by Destructors? Give an example.
15. Define Operator Overloading.
16. Define parameterized constructors.
17. Draw any two forms of inheritance.

SECTION – C

Answer ALL Questions : **(5 × 5 = 25)**

18. a) Distinguish between inheritance and polymorphism. **(OR)**
b) Explain Scope resolution operator with example.
19. a) Explain function prototyping. **(OR)**
b) Explain inline function with example.
20. a) How does a C++ structure differ from a C++ class? **(OR)**
b) Define a friend function. What is its use?
21. a) Explain constructors with its characteristics. **(OR)**
b) Explain copy constructor with example.
22. a) Distinguish between unary and binary operators. **(OR)**
b) Discuss multilevel inheritance.

SECTION – D

Answer any THREE Questions : **(3 × 10 = 30)**

23. Write a program for temperature conversion (Celsius to Fahrenheit and Fahrenheit to celsiers) using if – else statement.
24. Write a program to find the sum and average of given numbers using for loop.
25. Write a program for Binary to Decimal conversion.
26. Write a program to prepare mark list for N students.
27. Write a program to find average of two numbers using friend function.





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B.A. / B.Sc. Degree (Semester) Examinations, November 2018

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

SPACE SCIENCE

Under CBCS – Credit 2

Time: **2 Hours**

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(10 × 1 = 10)

- The term ISRO stands for
 - Indian Space Research Organization
 - Indian Science Research Organization
 - Indian Sound Research Organization
 - Indian Space Recent Organization
- Which one is the third position of our Solar system
 - Sun
 - Jupiter
 - Earth
 - Mars
- The biggest planet in our solar system is
 - Saturn
 - Jupiter
 - Venus
 - Pluto
- Which one planet has rocky rings
 - Earth
 - Mercury
 - Mars
 - Saturn
- The unwanted sound is named as
 - noise
 - music
 - light
 - none of the above
- The term optical is associated with
 - sound
 - frequency
 - light
 - velocity
- FM stands for
 - Frequency Modulation
 - Free Modulation
 - Fixed Modulation
 - Forced Modulation
- Which principle behind the optical fiber cable
 - refraction
 - reflection
 - total internal reflection
 - diffraction
- A body moving in an orbit around a planet is called a
 - missile
 - rocket
 - satellite
 - comet
- Who is the current director of ISRO
 - Dr.K.Sivan
 - Dr.S.Mathavan
 - Dr.G.Mathavan Nair
 - Dr.K.Kiran Kumar

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

- What is solar system?
- Write any two points about the Pluto planet?
- Define the term transmitter.
- What is modulation?
- State Newton's third law of motion.
- What is astrophysics?
- What is rocket?

SECTION – C

Answer ALL Questions :

(3 × 9 = 27)

- Discuss about the Moon - the closest neighbour. **(OR)**
 - Briefly explain the Jupiter the Giant.
- Give the theory of Mysterious Uranus. **(OR)**
 - Explain the phenomenon of Communication system.
- Explain the concept of fiber optic technology. **(OR)**
 - Give a note on Multistage rocket.

SECTION – D

Answer any TWO Questions :

(2 × 14 = 28)

- Discuss about the veiled Venus and scorched Mercury.
- Describe in detail about the Saturn and its rocky rings.
- List out the various benefits of optical fiber communication system.
- Describe in detail about the Geo stationary satellite.



Answer ALL Questions :

(10 × 1 = 10)

1. The upper layer of the convective zone is called _____.
a) Chromospheres b) Photosphere
c) Convective layer d) corona
2. 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
3. Which of the following instrument for the measurement of terrestrial radiation only?
a) Pyrhelimeter b) Pyranometer c) Pyrgeometer d) Pyradiometer
4. 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
5. Which of the following plate should have high thermal conductivity an adequate tensile strength?
a) Absorber plate b) Cover plate
c) Cotton wool d) none of the above
6. Which of the following institutions (organisation) has done pioneering worked in PV technology as panels being displayed as project sites?
a) ISRO b) BARC c) CEL d) SSPL

7. 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

8. Which of the following collectors use optical system in the form of reflectors or refractors?

- a) Focusing collector b) Liquid collector
- c) air collector d) none of the above

9. In India, a simple instrument is often used for quick measurement of the total solar radiation is

- a) Agni b) Suryamapi c) Suryalight d) Suryavista

10. 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

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

- 11. List out the types of solar energy measuring equipments.
- 12. Write down of the five main components of the flat plate collectors.
- 13. What is focusing collector?
- 14. What is the effect of dust?
- 15. What is solar cell?
- 16. Define fixed array of solar cell.
- 17. On what basis the materials are selected for flat plate collectors.

SECTION – C

Answer ALL Questions :

(3 × 9 = 27)

18. a) Explain about sunshine recorder in detail.

(OR)

b) Write about the main advantages of concentrator systems over flat plate collector.

19. a) Give a brief account on an typical air collector.

(OR)

b) Explain about a typical liquid collector.

20. a) Give an account on PV technology in India.

(OR)

b) Explain about Solar furnace in detail.

SECTION – D

Answer any TWO Questions :

(2 × 14 = 28)

- 21. Discuss briefly about pyranometer the most common instrument used for the measurement of global radiation.
- 22. Describe about solar concentrator and receiver geometries in detail.
- 23. Design the principle and construction, working structure of box type solar cooker.





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B.Sc. Physics Degree (Semester) Examinations, November 2018

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

FIBER OPTIC COMMUNICATION

Under CBCS – Credit 2

Time: **2 Hours**

Max. Marks: **75**

SECTION – A

Answer ALL Questions :

(10 × 1 = 10)

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. In an optical fiber, the concept of numerical aperture is applicable in describing the ability of _____.
 - a) light collection
 - b) light scattering
 - c) light dispersion
 - d) light polarization
4. Multimode step index fiber has
 - a) large core diameter & large NA
 - b) large core diameter and small NA
 - c) small core diameter and large NA
 - d) small core diameter & small NA
5. The operating wavelength of Nd: YAG laser is
 - a) 10 μm
 - b) 20 μm
 - c) 2 μm
 - d) 1.6 μm
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. Which of following is more sensitive
a) PIN diode b) APD c) neither a nor b d) either a or b
8. Source of light for optical fibre is
a) PIN diode b) Photo diode c) phototransistor d) LED
9. Photodetectors used in optical fibre is
a) PIN, APDs b) PIN, Gunn diodes
c) APD, Gunn diodes d) none of the above
10. The optimal NA achieved using PHASIL system is
a) 0.1 b) 0.3 c) 0.2 d) 0.4

SECTION – B

Answer any FIVE Questions : **(5 × 2 = 10)**

11. How an optical characteristic of a material is determined?
12. Enumerate three broad classes of optical fibres.
13. State the condition for total internal reflection.
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 : **(3 × 9 = 27)**

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 step 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 × 14 = 28)**

21. Explain the following terms in detail
a) Numerical aperture
b) Acceptance angle
c) Acceptance cone
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 2018

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

ARMED FORCES AND NATIONAL INTEGRATION

Under CBCS – Credit 2

 Time: **2 Hours**

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

1. The Kunzru's committee formed in the year of
 a) 1947 b) 1948 c) 1950 d) 1946
2. OTA located at
 a) Gwalior b) Kamptee c) Chennai d) Delhi
3. National song vande mataram was written by
 a) Tagore b) Chattarjee c) Shastri d) patel
4. Bhangra dance is related to
 a) Punjab b) Delhi c) Andrapradesh d) kerala
5. There are _____ bones in human body.
 a) 206 b) 202 c) 304 d) 218
6. Indian military academy (IMA) is located at _____.
 a) Dehradun b) Pune c) Mumbai d) Chennai
7. The NCC day of India is _____.
 a) Jan 15 b) Sep 05
 c) Jun 21 d) last Sunday of November
8. Vasectomy is a
 a) Family planning b) drug c) deficiency d) diseases
9. World environment day is
 a) Jun 05 b) June 21 c) Aug 15 d) Jan 26
10. Large scale felling of trees is known as
 a) Deforestation b) ecology c) environment d) pollution

SECTION – B

Answer any FIVE Questions :

(5 × 2 = 10)

11. State the motto of NCC.
12. Expand the terms: RDC and TSC.
13. Name any two war heroes.
14. Which was the 4th war fought between India and Pakistan.
15. Who is a leader?
16. What is hygiene?
17. What are the effects of environment degradation?

SECTION – C

Answer ALL Questions :

(3 × 9 = 27)

18. a) What are the Cardinal points of NCC ? **(OR)**
b) Draw the different ranks in army officer.
19. a) What are the contributions of youth in nation building? **(OR)**
b) What are the qualities of a leader?
20. a) Draw the structures of NCC organization. **(OR)**
b) How to develop personality?

SECTION – D

Answer any TWO Questions :

(2 × 14 = 28)

21. Write down the NCC songs.
22. Write an essay about the national integration.
23. Describe the various systems of human body.
24. Explain the air pollution and water pollution.

