CHAPTER-1 Rotational Dynamics

1) Distinguish between centripetal force and centrifugal force
2) Obtain Expression of speed of vehicle on: a) banked road b) unbanked road
3) Obtain Expression of time period of conical pendulum
4) Show that in vertical circular motion T2-T1=6mg
5) Obtain Expression of kinetic energy of rotating body
6) Define moment of inertia and state its physical significance
7) Derive Expression of torque for rotating body
8) State and Explain Theorem of parallel axis
9) State and Explain law of conservation of angular momentum
10) Obtain Expression of K.E, velocity and Acceleration of body moving on inclined plain
11) A spherical water balloon is revolving at 60 rpm. In the course of time, 48.8 % of its water leaks out. With what frequency will the remaining balloon revolve now? Neglect all non-conservative
12) A racing track of curvature 9.9 m is banked at tan-1 (0. 5).Coefficient of static friction between the track and the tyres of a vehicle is 0.2. Determine the speed limits with 10 % margin.
13) A fan is rotating at 90 rpm. It is then switched OFF. It stops after 21 revolutions. Calculate the time taken by it to stop assuming that the frictional torque is constant.
14) A ballet dancer spins about a vertical axis 90 rpm with arms outstretched. With the arms folded, the moment of inertia about the same axis of rotation changes to 75%. Calculate the new speed of rotation.

Chapter-2 Fluid Mechanics

1) Obtain Expression of hydrostatic pressure due to liquid column
2) Explain pascal law with its application
3) A hydraulic brake system of a car of mass 1000 kg having speed of 50 km/h, has a cylindrical piston of radius of 0.5 cm. The slave cylinder has a radius of 2.5 cm. If a constant force of 100 N is

applied on the brake what distance the car will travel before coming to stop?

4) Explain surface tension on basis of molecular theory
5) Obtain expression of relation between surface energy and surface tension
6) Define angle of contact and states its properties
7) Define capillary and explain capillary action with example
8) Obtain Expression of Excess of pressure inside bubble
9) Obtain Expression of height of Rise of liquid inside capillary
10) Calculate the work done in blowing a soap bubble to a radius of 1 cm. The surface tension of soap solution is 2.5 × 10-2 N/m.
11) What should be the diameter of a water drop so that the excess pressure inside it is 80 N/m2 ? (Surface tension of water = 7.27 × 10-2 N/m)
12) A capillary tube of radius 5 × 10-4 m is immersed in a beaker filled with mercury. The mercury level inside the tube is found to be 8 × 10-3 m below the level of reservoir. Determine the angle of contact between mercury and glass. Surface tension of mercury is 0.465 N/m and its density is 13.6 × 103 kg/m3
13) Distinguish between streamline flow and turbulent flow
14) Define viscosity and hence explain newton law of viscosity
15) Obtain Expression of terminal velocity
16) Explain in detail Bernoulli's Equation
17) Discuss in detail continuity Equation
18) A spherical drop of oil falls at a constant speed of 4 cm/s in steady air. Calculate the radius of the drop. The density of the oil is 0.9 g/cm3 , density of air is 1.0 g/cm3 and the coefficient of viscosity of air is 1.8 × 10-4 poise, (g = 980 cm/s2)
19) Twenty-seven droplets of water, each of radius 0.1 mm coalesce into a single drop. Find the change in surface energy. Surface tension of water is 0.072 N/m.
20) How much work is required to form a bubble of 2 cm radius from the soap solution having surface tension 0.07 N/m.

21) A drop of mercury of radius 0.2 cm is broken into 8 droplets of the same size. Find the work done if the surface tension of mercury is 435.5 dyne/cm.

Chapter-3: Kinetic Theory of Gases

1) Obtain Expression of pressure Exerted by gas molecule on wall of container.
2) Obtain Expression of kinetic Energy of gas molecule
3) Obtain Expression of RMS Speed
4) Derive Mayer's relation
5) Learn DOF ,ratio of specific heat ,k.E per translation ,rotational and vibrational degree of freedom…..MCQ
6) Explain Ferry black body
7) What is athermanous and diathermanous substance.
8) Explain coefficient of absorption,reflection,emission,transmission
9) Explain Kirchhoff's Law of Heat Radiation and its Theoretical Proof
10) Explain Spectral Distribution of Blackbody Radiation
11) Explain Wien's Displacement Law and Stefan-Boltzmann Law of Radiation
12) Calculate the energy radiated in one minute by a blackbody of surface area 200 cm2 at 127 o C ($\sigma = 5.7 \times 10\text{-}8$J m-2 s-1 K-4)
13) A 60-watt filament lamp loses all its energy by radiation from its surface. The emissivity of the surface is 0.5. The area of the surface is $5 \times 10\text{-}5$ m2 . Find the temperature of the filament($\sigma = 5.67 \times 10\text{-}8$J m-2 s-1 K-4).
14) Compare the rate of loss of heat from a metal sphere at 827 ºC with the rate of loss of heat from the same sphere at 427 ºC, if the temperature of the surrounding is 27 ºC
15) Compare the rms speed of hydrogen molecules at 127 ºC with rms speed of oxygen molecules at 27 ºC given that molecular masses of hydrogen and oxygen are 2 and 32 respectively
16) Calculate the average molecular kinetic energy (i) per kmol (ii) per kg (iii) per molecule of oxygen at 127 ºC, given that molecular

weight of oxygen is 32, R is 8.31 J mol-1 K-1 and Avogadro's number NA is 6.02 x 1023 molecules mol-1

Chapter 4- Thermodynamics

1) Obtain Expression of work done in adiabatic process
2) Obtain expression of work in isothermal and isobaric process
3) Explain in detail performance of heat engine and Refrigerator
4) Explain in detail Carnot cycle
5) Explain Second Law of Thermodynamics
6) Explain Sterling Cycle
7) A gas contained in a cylinder fitted with a frictionless piston expands against a constant external pressure of 1 atm from a volume of 5 litres to a volume of 10 litres. In doing so it absorbs 400 J of thermal energy from its surroundings. Determine the change in internal energy of system.
8) A system releases 125 kJ of heat while 104 kJ of work is done on the system. Calculate the change in internal energy.
9) Efficiency of a Carnot cycle is 75%. If temperature of the hot reservoir is 727ºC, calculate the temperature of the cold reservoir.
10) A Carnot refrigerator operates between 250ºK and 300ºK. Calculate its coefficient of performance.
11) An ideal gas is taken through an isothermal process. If it does 2000 J of work on its environment, how much heat is added to it?
12) An ideal monatomic gas is adiabatically compressed so that its final temperature is twice its initial temperature. What is the ratio of the final pressure to its initial pressure?

CHAPTER-5 Oscillations

1) Obtain Expression of differential equation of S.H.M
2) Obtain expression of velocity ,displacement and acceleration of particle performing S.H.M
3) Show that projection of particle performing U.C.M along any diameters is S.H.M

4) A particle performs linear S.H.M. of period 4 seconds and amplitude 4 cm. Find the time taken by it to travel a distance of 1 cm from the positive extreme position
5) The speeds of a particle performing linear S.H.M. are 8 cm/s and 6 cm/s at respective displacements of 6 cm and 8 cm. Find its period and amplitude.
6) The maximum velocity of a particle performing S.H.M. is 6.28 cm/s. If the length of its path is 8 cm, calculate its period
7) The maximum speed of a particle performing linear S.H.M is 0.08 m/s. If its maximum acceleration is 0.32 m/ s2 , calculate its (i) period and (ii) amplitude.
8) Gives graphical Representation of particle starting from mean and Extreme position
9) Show that total Energy is conserved in S.H.M
10) Define simple pendulum and obtain Expression of time period of simple pendulum
11) Explain laws of simple pendulum
12) Explain detail damp oscillation
13) The period of oscillations of a simple pendulum increases by 10%, when its length is increased by 21 cm. Find its initial length and initial period.
14) In summer season, a pendulum clock is regulated as a second's pendulum and it keeps correct time. During winter, the length of the pendulum decreases by 1%. How much will the clock gain or lose in one day. (g = 9.8 m/s2)
15) Define Angular S.H.M. and state its Differential Equation
16) Two parallel S.H.M.s represented by x1 = 5sin (4π t + π/3) cm and x2 = 3sin (4πt + π/4) cm are superposed on a particle. Determine the amplitude and epoch of the resultant S.H.M.
17) Potential energy of a particle performing linear S.H.M is 0.1 π2 x2 joule. If mass of the particle is 20 g, find the frequency of S.H.M.

18) The total energy of a body of mass 2 kg performing S.H.M. is 40 J. Find its speed while crossing the centre of the path.

CHAPTER 6. Superposition of Waves

1) Explain Properties of progressive waves
2) Define Stationary wave and obtain Expression of standard equation of stationary wave
3) The displacements of two sinusoidal waves propagating through a string are given by the following equation

$y_1 = 4\sin(20x - 30t)$

$y_2 = 4\sin(25x - 40t)$ where x and y are in centimetre and t is in second. a) Calculate the phase difference between these two waves at the points x = 5 cm and t = 2 s. b) When these two waves interfere, what are the maximum and minimum values of the intensity?

4) Explain Properties of Stationary Waves
5) Find the distance between two successive nodes in a stationary wave on a string vibrating with frequency 64 Hz. The velocity of progressive wave that resulted in the stationary wave is 48 m/s
6) Distinguish between free and force vibration
7) Obtain expression of fundamental frequency of a) open pipe b) closed pipe
8) Obtain expression fundamental frequency a stretched String
9) The velocity of a transverse wave on a string of length 0.5 m is 225 m/s. (a) What is the fundamental frequency of a standing wave on this string if both ends are kept fixed? (b) While this string is vibrating in the fundamental harmonic, what is the wavelength of sound produced in air if the velocity of sound in air is 330 m/s?
10) Explain Laws of a Vibrating String
11) Define beat and Obtain Expression of beat frequency
12) Two sound waves having wavelengths 81cm and 82.5 cm produce 8 beats per second. Calculate the speed of sound in air.

13) Two tuning forks having frequencies 320 Hz and 340 Hz are sounded together to produce sound waves. The velocity of sound in air is 326.4 m s-1. Find the difference in wavelength of these waves
14) Find the fundamental, first overtone and second overtone frequencies of a pipe, open at both the ends, of length 25 cm if the speed of sound in air is 330 m/s.
15) Two sound waves travel at a speed of 330 m/s. If their frequencies are also identical and are equal to 540 Hz, what will be the phase difference between the waves at points 3.5 m from one source and 3 m from the other if the sources are in phase?
16) A set of 8 tuning forks is arranged in a series of increasing order of frequencies. Each fork gives 4 beats per second with the next one and the frequency of last fork is twice that of the first. Calculate the frequencies of the first and the last fork.
17) A sonometer wire is stretched by tension of 40 N. It vibrates in unison with a tuning fork of frequency 384 Hz. How many numbers of beats get produced in two seconds if the tension in the wire is decreased by 1.24 N?

CHAPTER -7: Wave Optics

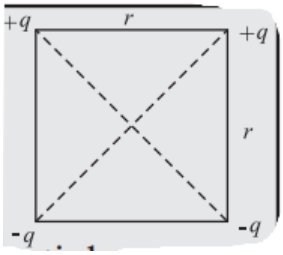
1) Define wavefront and wave normal. Hence Explain type of wavefront
2) Explain in detail Huygens' Principle
3) Explain Reflection of Light at a Plane Surface
4) Explain Refraction of Light at a Plane Surface
5) Explain following term: a) unpolarized light b) polarized light c) Brewster law d) Malus Law
6) Explain constructive and destructive Interference
7) State and Explain condition of steady interface pattern
8) What is meant by coherent sources? What are the two methods for obtaining coherent sources in the laboratory?

9) Derive the conditions for bright and dark fringes produced due to diffraction by a single slit.
10) What is diffraction of light? How does it differ from interference? What are Fraunhofer and Fresnel diffractions?
11) Describe what is Rayleigh's criterion for resolution. Explain it for a telescope and a microscope
12) Explain in detail Resolving power of microscope & telescope
13) White light consists of wavelengths from 400 nm to 700 nm. What will be the wavelength range seen when white light is passed through glass of refractive index 1.55?
14) A double-slit arrangement produces interference fringes for sodium light (- 589 nm) that are 0.20° apart. What is the angular fringe separation if the entire arrangement is immersed in water (n = 1.33)?
15) In a biprism experiment, the fringes are observed in the focal plane of the eyepiece at a distance of 1.2 m from the slits. The distance between the central bright band and the 20th bright band is 0.4 cm. When a convex lens is placed between the biprism and the eyepiece, 90 cm from the eyepiece, the distance between the two virtual magnified images is found to be 0.9 cm. Determine the wavelength of light used.
16) In Fraunhofer diffraction by a narrow slit, a screen is placed at a distance of 2 m from the lens to obtain the diffraction pattern. If the slit width is 0.2 mm and the first minimum is 5 mm on either side of the central maximum, find the wavelength of light.
17) A parallel beam of green light of wavelength 546 nm passes through a slit of width 0.4 mm. The intensity pattern of the transmitted light is seen on a screen which is 40 cm away. What is the distance between the two first order minima?
18) The distance between two consecutive bright fringes in a biprism experiment using light of wavelength 6000 Å is 0.32 mm by how much will the distance change if light of wavelength 4800 Å is used?

19) Obtain Expression of Fraunhofer Diffraction at a Single Slit
20) Distinguish between interference and diffraction

CHAPTER 8:Electrostatics

1) Explain gauss theorem and hence obtain Expression of Electric field intensity due to hollow sphere
2) Obtain Expression of electric field due to infinitely long cylinder carrying charge
3) Obtain Expression of electric field due to infinitely thin plane sheets
4) A sphere of radius 10 cm carries a charge of 1μC. Calculate the electric field (i) at a distance of 30 cm from the centre of the sphere (ii) at the surface of the sphere and (iii) at a distance of 5 cm from the centre of the sphere.
5) The length of a straight thin wire is 2 m. It is uniformly charged with a positive charge of 3μC. Calculate (i) the charge density of the wire (ii) the electric intensity due to the wire at a point 1.5 m away from the centre of the wire
6) Obtain Expression of electric potential energy and hence obtain Expression of electric potential
7) Potential at a point A in space is given as 4 × 105 V. (i) Find the work done in bringing a charge of 3 μC from infinity to the point A. (ii) Does the answer depend on the path along which the charge is brought ?
8) Obtain Expression of Electric potential due to an electric dipole
9) Two charges 5 × 10-8 C and -3 × 10-8 C are located 16 cm apart. At what point (s) on the line joining the two charges is the electric potential zero ? Take the potential at infinity to be zero.
10) Explain Electric potential in detail
11) Calculate the electrostatic potential energy of the system of charges shown in the figure.



12) a) Determine the electrostatic potential energy of a system consisting of two charges -2 μC and +4 μC (with no external field) placed at (-8 cm, 0, 0) and (+8 cm, 0, 0) respectively. b) Suppose the same system of charges is now placed in an external electric field E = A (1/r2), where A = 8 × 105 cm-2, what would be the electrostatic potential energy of the configuration

13) Obtain Expression of Potential energy of a dipole in an external field

14) What is capacitor and hence explain Principle of a capacitor

15) Obtain Expression of Energy stored in capacitor

16) Obtain Expression of parallel plate capacitor

17) Obtain Capacitance of a parallel plate capacitor with a dielectric slab between the plates

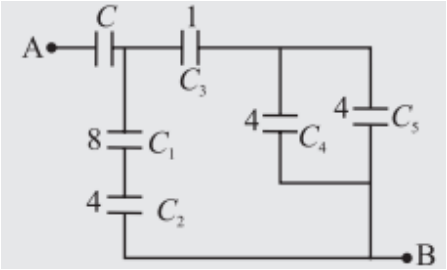
18) A parallel plate capacitor has an area of 4 cm2 and a plate separation of 2 mm (i) Calculate its capacitance (ii) What is its capacitance if the space between the plates is filled completely with a dielectric having dielectric constant of constant 6.7.

19) A parallel plate air capacitor has a capacitance of 3 × 10–9 Farad. A slab of dielectric constant 3 and thickness 3 cm completely fills the space between the plates. The potential difference between the plates is maintained constant at 400 volt. What is the change in the energy of capacitor if the slab is removed ?

20) Explain principal, construction and working of Van de Graaff Generator

21) One hundred twenty five small liquid drops, each carrying a charge of 0.5 μC and each of diameter 0.1 m form a bigger drop. Calculate the potential at the surface of the bigger drop

22) From the figure given below find the value of the capacitance C if the equivalent capacitance between A and B is to be 1 μF. All other capacitors are in micro farad.



23) Obtain expression of capacitance of capacitor in series

CHAPTER 9: Current Electricity

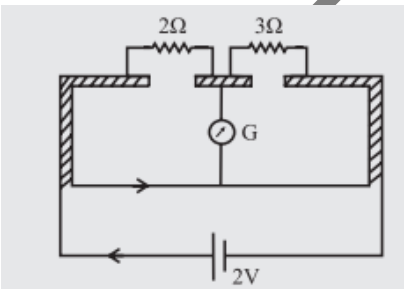
1) Explain KCL & KVL in detail
2) Explain Wheatstone meter bridge in detail
3) Explain the principal, construction and working of of Wheatstone meter bridge in detail
4) Explain the principal of potentiometer
5) Obtain Expression of internal resistance of cell
6) Explain different type of error occur in whetstone meter bridge and ways to minimize them
7) Obtain expression of to convert a moving coil galvanometer (MCG) into an ammeter
8) A galvanometer has a resistance of 100 Ω and its full scale deflection current is 100 μ A. What shunt resistance should be added so that the ammeter can have a range of 0 to 10 mA
9) A Galvanometer has a resistance of 40 Ω and a current of 4 mA is needed for a full scale deflection . What is the resistance and how is it to be connected to convert the galvanometer (a) into an ammeter of 0.4 A range and (b) into a voltmeter of 0.5 V range?
10) Distinguish between a) ammeter and voltmeter b) galvanometer and potentiometer
11) Describe Kelvin's method to determine the resistance of a galvanometer by using a meter bridge.

12) A potentiometer wire has a length of 1.5 m and resistance of 10 Ω. It is connected in series with the cell of emf 4 Volt and internal resistance 5 Ω. Calculate the potential drop per centimetre of the wire

13) A potential drop per unit length along a wire is 5 x 10-3 V/m. If the emf of a cell balances against length 216 cm of this potentiometer wire, find the emf of the cell.

14) When two cells of emfs. ε 1 and ε 2 are connected in series so as to assist each other, their balancing length on a potentiometer is found to be 2.7 m. When the cells are connected in series so as to oppose each other, the balancing length is found to be 0.3 m. Compare the emfs of the two cells.

15) Two resistances 2 ohm and 3 ohm are connected across the two gaps of the metre bridge as shown in figure. Calculate the current through the cell when the bridge is balanced and the specific resistance of the material of the metre bridge wire. Given the resistance of the bridge wire is 1.49 ohm and its diameter is 0.12 cm.



CHAPTER 10. Magnetic Fields due to Electric Current

1) Explain in detail construction, working and principal of cyclotron
2) Obtain Expression of Magnetic Force on a Wire Carrying a Current
3) Explain principal, construction and working of Moving Coil Galvanometer
4) Obtain Expression of magnetic dipole moment
5) A circular coil of conducting wire has 500 turns and an area 1.26×10-4 m2 is enclosed by the coil. A current 100 μA is passed through the coil. Calculate the magnetic moment of the coil.

6) Explain in detail Biot savart law
7) Obtain Expression of Force of Attraction between two Long Parallel Wires
8) Obtain Expression of Magnetic Field Produced by a Current in a Circular Arc of a Wire
9) Obtain Expression of Axial magnetic Axial Magnetic Field Produced by Current in a Circular Loop
10) Consider a closely wound 1000 turn coil, having radius of 1m. If a current of 10A passes through the coil, what will be the magnitude of the magnetic field at the centre?
11) Explain Ampere circuital in in detail and hence obtain Expression of magnetic field due to straight current carrying wire
12) Obtain Expression of Magnetic Field of a Solenoid and toroid
13) A solenoid of length 25 cm has inner radius of 1 cm and is made up of 250 turns of copper wire. For a current of 3A in it, what will be the magnitude of the magnetic field inside the solenoid?
14) An electron is moving with a speed of 3 × 10-7 m/s in a magnetic field of 6 × 10-4 T perpendicular to its path. What will be the radium of the path? What will be frequency and the energy in keV ? [Given: mass of electron = 9 ×10-31 kg, charge e = 1.6 × 10-19 C, 1 eV = 1.6 × 10-19 J]
15) Current of equal magnitude flows through two long parallel wires having separation of 1.35 cm. If the force per unit length on each of the wires in 4.76 × 10-2 N, what must be I
16) A moving coil galvanometer has been fitted with a rectangular coil having 50 turns and dimensions 5 cm × 3 cm. The radial magnetic field in which the coil is suspended is of 0.05 Wb/m2 . The torsional constant of the spring is 1.5 × 10-9 Nm/ degree. Obtain the current required to be passed through the galvanometer so as to produce a deflection of 30°.
17) Calculate the value of magnetic field at a distance of 2 cm from a very long straight wire carrying a current of 5 A (Given: $\mu_0 = 4\pi \times 10^{-7}$ Wb/Am).

18) A toroid of narrow radius of 10 cm has 1000 turns of wire. For a magnetic field of 5 × 10-2 T along its axis, how much current is required to be passed through the wire?

CHAPTER 11. Magnetic Materials

1) Obtain Expression of angular simple harmonic motion
2) Obtain Expression of Magnetic Moment of an Electron Revolving Around the Nucleus of an Atom
3) Explain Magnetization and Magnetic Intensity
4) The region inside a current carrying toroid winding is filled with Aluminium having susceptibility $\chi = 2.3 \times 10^{-5}$. What is the percentage increase in the magnetic field in the presence of Aluminium over that without it?
5) Explain properties of diamagnetic, paramagnetic and ferromagnetic material
6) Explain domain theory and curie temperature
7) Which property of soft iron makes it useful for preparing electromagnet?
8) Explain Hysteresis curve in detail
9) A rod of magnetic material of cross section 0.25 cm2 is located in 4000 Am-1 magnetising field. Magnetic flux passing through the rod is 25 × 10-6 Wb. Find out (a) relative permeability (b) magnetic susceptibility and (c) magnetisation of the rod
10) An electron in an atom is revolving round the nucleus in a circular orbit of radius 5.3 × 10-11 m, with a speed of 2 × 106 m/s. Find the resultant orbital magnetic moment and angular momentum of electron. (Charge on electron e = 1.6 × 10-19 C, mass of electron m = 9.1 × 10-31 kg.)
11) A short bar magnet is placed in an external magnetic field of 700 gauss. When its axis makes an angle of 30° with the external magnetic field, it experiences a torque of 0.014 Nm. Find the magnetic moment of the magnet, and the work done in moving it from its most stable to most unstable position

CHAPTER 12. Electromagnetic Induction

1) Explain Faraday and lenzs law of electromagnetic induction
2) What are eddy currents? State applications of eddy currents.
3) Obtain Expression of translational emf of rectangular coil b) rotational emf of bar
4) Explain in detail principal, construction and working of A.C generator
5) A conducting loop of area 1 m2 is placed normal to uniform magnetic field 3Wb/m2 . If the magnetic field is uniformly reduced to 1 Wb/m2 in a time of 0.5 s, calculate the induced emf produced in the loop
6) Define self-inductance and hence obtain expression of Inductance of a solenoid
7) Obtain Expression of Energy Stored in a Magnetic Field
8) Distinguish between self and mutual inductance and hence explain coupling factor
9) Explain in detail principal, construction and working of transformer & hence distinguish between step up and stepdown transformer
10) A horizontal wire 20 m long extending from east to west is falling with a velocity of 10 m/s normal to the Earth's magnetic field of 0.5×10-4 T. What is the value of induced emf in the wire?
11) The primary and secondary coil of a transformer each have an inductance of 200 ×10-6H. The mutual inductance (M) between the windings is 4×10-6 H. What percentage of the flux from one coil reaches the other?
12) A search coil having 2000 turns with area 1.5 cm2 is placed in a magnetic field of 0.60T. The coil is moved rapidly out of the field in a time of 0.2 second. Calculate the induced emf across the search coil.
13) Calculate the value of induced emf between the ends of an axle of a railway carriage 1.75 m long travelling on level ground with a

uniform velocity of 50 km per hour. The vertical component of Earth's magnetic field (Bv) is given to be 5×10-5T.

CHAPTER 13. AC Circuits

1) Obtain Expression of R.M.S and average value of induced e.m.f
2) An alternating voltage is given by e = 6 sin 314 t. find (i) the peak value (ii) frequency (iii) time period and (iv) instantaneous value at time t = 2 ms
3) Obtain Expression of average power of R.L.C series circuit
4) A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which R = 3Ω, L = 25.48 mH and C = 796 μf. Find i) The impedance of the circuit ii) The phase difference between the voltage across source and the currents iii) The power factor iv) The power dissipated in the surface
5) Explain in detail LC Oscillations
6) Show that in an AC circuit containing a pure inductor, the voltage is ahead of current by π/2 in phase.
7) Derive an expression for the impedance of an LCR circuit connected to an AC power supply.
8) A 10 μF capacitor is charged to a 25 volt of potential. The battery is disconnected and a pure 100 m H coil is connected across the capacitor so that LC oscillations are set up. Calculate the maximum current in the coil.
9) An AC source generating a voltage e = e0 sinωt is connected to a capacitor of capacitance C. Find the expression for the current i flowing through it. Plot a graph of e and i versus wt
10) A light bulb is rated 100W for 220 V AC supply of 50 Hz. Calculate (a) resistance of the bulb. (b) the rms current through the bulb.

CHAPTER 14: Dual Nature of Radiation and Matter

1) Define photoelectric effect and hence Explain its characteristics
2) Explain Einstein equation for photoelectric effect in detail

3) Explain photoelectric effect in detail with diagram
4) Explain variation of photoelectric current with frequency, intensity and with potential
5) (a) Calculate the energies of photons corresponding to ultraviolet light and red light, given that their wavelengths are 3000 Å and 7000 Å respectively. (Remember that the photon are not coloured. Colour is human perception for that frequency range.) (b) A typical FM radio station has its broadcast frequency 98.3 MHz. What is the energy of an FM photon of this frequency?
6) The wavelength and intensity of the incident light is 4000 Å and 0.1 W respectively. What is the minimum change in the light energy? What is the number of incident photons?
7) Explain photocell in detail
8) Explain De Broglie Hypothesis in detail
9) Draw Davisson and Germen Experiment diagram
10) Calculate the de Broglie wavelength of an electron moving with kinetic energy of 100 eV passing through a circular hole of diameter 2 Å.
11) The threshold wavelength of tungsten is 2.76 × 10-5 cm. (a) Explain why no photoelectrons are emitted when the wavelength is more than 2.76 × 10-5 cm. (b) What will be the maximum kinetic energy of electrons ejected in each of the following cases (i) if ultraviolet radiation of wavelength λ = 1.80 × 10-5 cm and (ii) radiation of frequency 4×1015 Hz is made incident on the tungsten surface.
12) Calculate the wavelength associated with an electron, its momentum and speed
    (a) when it is accelerated through a potential of 54 V
    (b) when it is moving with kinetic energy of 150 eV.

CHAPTER 15. Structure of Atoms and Nuclei

1) Explain in detail Hydrogen spectrum
2) Explain in detail Bohr's postulates

3) Obtain Expression of radius of Bohr's orbit
4) Calculate the radius of the 3rd orbit of the electron in hydrogen atom.
5) Obtain Expression of Energy of the Electrons in Bohr's orbits
6) Calculate the wavelengths of the first three lines in Paschen series of hydrogen atom.
7) Determine the series limit of Balmer, Paschen and Pfund series, given the limit for Lyman series is 912 Å.
8) Obtain Expression of law if radioactivity and hence obtain Half-life of Radioactive Material
9) Obtain Expression of Average Life of a Radioactive Species
10) The half-life of a nuclear species NX is 3.2 days. Calculate its (i) decay constant, (ii) average life and (iii) the activity of its sample of mass 1.5 mg
11) Determine the maximum angular speed of an electron moving in a stable orbit around the nucleus of hydrogen atom
12) What is the amount of 27 60Co necessary to provide a radioactive source of strength 10.0 mCi, its half-life being 5.3 years?
13) Disintegration rate of a sample is 1010 per hour at 20 hrs from the start. It reduces to 6.3 × 109 per hour after 30 hours. Calculate its half-life and the initial number of radioactive atoms in the sample.

CHAPTER 16. Semiconductor Devices

1) Explain construction working of a) Half wave rectifier b) full wave rectifiers
2) What is Zener diode and hence Explain Zener diode as voltage regulator
3) What is solar cell and hence Explain the working of Solar Cell or Photovoltaic Cell
4) Draw Circuit symbol of photodiode, LED, NPN & PNP Transistor
5) Explain application and advantage of LED.
6) Explain current gain and voltage gain of transistor

7) Explain Transistor as an Amplifier
8) Explain Transistor as an switch
9) Explain gate symbol and its Truth table for all logic gate
10) The common-base DC current gain of a transistor is 0.967. If the emitter current is 10mA. What is the value of base current.
11) In a comman-base connection, a certain transistor has an emitter current of 10mA and collector current of 9.8 mA. Calculate the value of the base current.
12) In a common-base connection, the emitter current is 6.28mA and collector current is 6.20 mA. Determine the common base DC current gain.
13) Explain in detail Input and output characteristic of transistor