**SUB : PHYSICS**

**SET 1**

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|  | 1. Show that motion of a compound pendulum is simple harmonic and derive its time period. Show that point of suspension and point of oscillation are interchangeable. (3+3+3=9) 2. Spherical waves are emitted from a 1W source in an istropic non-absorbing medium. What is the wave intensity 1m from the source? (6) |  |
|  | 1. Define electric field and electric potential Find the electric field and potential due to a dipole at any point.(9) 2. Show that for the electromagnetic wave E/B=c, the symbols having their usual meanings (6) |  |
|  | 1. Show that the free charge is always greater than induced charge produced due to the presence of dielectric material between the plates of the capacitor. Hence derive the relation between three electric vectors **E**,**D** and **P**. (2+3+4=9) 2. How many time constants must elapse before a capacitor in an RC circuit is charged to within 1% of its equilibrium charge?(6) |  |
|  | 1. State Biot-Savart’s law. Use it to find the magnetic field due to an infinitely long straight wire. (2+7=9)      1. A circular loop of wire 5 cm in radius carries a current of 100 A. What is the energy density at the center of the loop? (6) |  |
|  | a) Derive the expression for the rise and fall of current in an RL circuit. (9)   1. What are the (i) mean time between collisions? (ii) The mean free path for free electrons in copper? (Given n=8.4x1028m-3, ρ=1.7x10-8Ωm,vavg=1.6x106 m/s.) (6) |  |
|  | 1. Discuss about Lorentz force and explain about Hall effect, thereby deriving the expressions for the Hall coefficient, concentration of charge carriers, Hall voltage, Hall field, Hall resistance and Hall mobility. (9) 2. Sunlight strikes the earth outside its atmosphere with an intensity of 2 cal/square cm-min. Calculate the electric and magnetic fields for sunlight.(6) |  |
|  | Write short notes on: (A**ny Two) (2x5=10)**   1. Energy in S.H.M 2. Self induction and self inductance 3. Capacitance and energy density |  |

**SET 2**

 a) Ultrasound and piezoelectric method

b)Principle of generation of LASER light

c)Forward and reverse biasing

**SET 3**

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| 1 | 1. Derive the non differential form of SHM. Discuss the energy consideration in SHM with graphs (9) 2. A wave travelling along a stretched string is given by   y(x,t)=10sin(0.01x-2.00t) where x and y are in cm and t in seconds. (i) What are the amplitude, wave length, frequency and velocity of this wave? (ii) What is the maximum transverse speed of a particle in the rope? (6) |  |
| 2 | 1. Which aspect of light is demonstrated by interference? Discuss analytical treatment of interference on the basis of intensity and phase difference. Also derive the relation between the optical path and geometrical path.( 9) 2. Find the thickness of quarter wave plate when the wavelength of light is 5890 Ao. Given μE=1.553 and μO=1.544. (6) |  |
| 3 | 1. Define E and V. Derive the electric field and potential due to quadrupole. (2+3+4=9) 2. A charge of 5xC is distributed between two spheres. It is found that they repel each other with a force of 1N when their centres are 2m apart. Find the charge on each sphere.(6) |  |
| 4 | 1. State Biot-Savart’s law. Use it to find the magnetic field due to a circular wire. (2+7=9)      1. The inductance of a close packed coil of 400 turns is 8 mH. What is the magnetic flux through the coil when the current is 5x Ampere? (6) |  |
|  | a) Derive Maxwell’s equations and write their significance. (9)  b)Find the least energy of a particle (electron) in a 1-D box in eV. (6) |  |
|  | 1. a) Discuss atomic view of resistivity and derive the relation between J and E. (9)   b) An observer is at a distance of 1.8 m from a point source of light whose power output is 250 W. Find peak and rms values of E and B.(6) |  |
|  | . Write short notes on: (A**ny Two) (2x5=10)**  a.Double refraction  b.Inductor and energy density  c. Optical Fiber |  |

**SET 4**

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| 1 | a )Why is SHM important in physics? Show that motion of a compound pendulum is simple harmonic and derive its time period. Show that point of suspension and point of oscillation are interchangeable.  b)A wave travelling along a stretched string is given by  y(x,t)=10sin(0.01x-2.00t) where x and y are in cm and t in seconds. (i) What are the amplitude, wave length, frequency and velocity of this wave? (ii) What is the maximum transverse speed of a particle in the rope? | (9)  (6) |
| 2 | a)What is interference? Discuss interference in thin film.  b)A soap film of refractive index 1.33 is illuminated with light of different wavelength at an angle of . There is complete destructive interference for λ =5890 . Find the thickness of the film. | (2+7)  (6) |
| 3 | a)Define electric field and electric potential. State Gauss’s law and use it to find the electric field due to an infinitely long cylinder of charge and spherical distribution of charge.  b)What is the value of E andV at the centre of a square of side 1m and charges +2, -2, +2 and +2C at each corner). | (2+3+4=9)  (6) |
| 4 | a)State Biot-Savart’s law. Use it to find the magnetic field due to finitely long straight wire.  b)A solenoid has an inductance of 53 mH and a resistance of 0.37 Ω. If it is connected to a battery, how long will it take for a current to reach one half its final equilibrium value? | (9) |
| 5 | 1. Discuss the LC oscillation. Hence prove that the frequency of oscillation is f =. 2. Two conductors are of the material and of the same length. The first conductor is a solid wire of diameter 1mm and the second is a hollow wire of diameters 2mm and 1mm. Find their reistance ratio. (6) | (9) |
| 6 | a)What is the significance of wave function ψ? Derive the time dependent Schrodinger wave equation for a free particle.  b)How many orders will be visible if the wavelength of the incident radiation is 5000 Ao and the number of the lines on the grating is 2620 in one inch. | (9)  (6) |
| 7 | Write short notes on **any two:**   1. Ultrasound and methods of production 2. Spontaneous and stimulated emission 3. PN junction, forward biasing and knee voltage | 2x5=10 |