Numerical problems for Practice.

Q. 1 A wedge shaped air film having an angle of 40 seconds is illuminated by monochromatic light and fringes are observed vertically through microscope. The distance measured between consecutive bright fringes is 0.12cm. calculate the wave length light used.

Q.2. Interference fringes are produced with monochromatic light falling normally on a wedge shaped film of refractive index 1.4 . The angle of wedge is 10 seconds of an arc and the distance between successive fringes is 0.5 cm . What is the wavelength used.

Q.3.Give experimental set up to obtain Newton,s rings. Explain how interference takes place. In a Newtons rings experiments , the diameter of the 5^{th} ring was 0.336 cm and that of 15^{th} ring was 0.59 cm. Find the radius of curvature of the Plano convex lens, if the wavelength of light used is 5890 Angstrom.

Q.4. A monochromatic beam of light of wavelength 5893Angstrom is incident normally on the top of a glass which is coated by trans parent material having R. I. 1.38. Calculate smallest thickness of the MgF_2 layer which will act as a non reflecting surface.

Q.5. A parallel beam of light 622 nm incident on a glass plate of refractive index 1.5 such that angle of refraction into the plate is 60^o. Calculate the smallest thickness of the plate which will appear dark by reflection.

Q.5. A soap film having index 1.33 and thickness $5x10^{-5}$ cm is viewed at angle of 35^o to the normal. Find the wavelength of light in the visible spectrum which will be absent from the reflected light.

Q.6.A plane transmission grating has 5000 lines/cm. Find out the highest order of spectrum observed if incident light has wave length= $6000A^o$.

Q.7.Find the half angular width of the central maxima in the fraunhoffer diffraction pattern of slit having width$10x10^{-5}$ cm when illuminated by light having wavelength $5000A^o$.

Q. Monochromatic light from a helium neon laser (wavelength=6328A0 is incident normally on a diffraction grating 6000lines/cm Find the angles at which one would observe the first order the maximum, second order maximum etc.

Q.8.A laser light of wavelength 6328A. U. falls normally on a grating which is 2 cm long. The fist order spectrum is observed at an angle of 20^o.Find the total no of slits on grating.

Q9.In a grating , the angle for diffraction for the second order principal ,maximum for the light of wavelenth$5x10^{-5}$cm is 30^o.Calculate the number of lines per centimeter of the grating surface.

Q.10.A mono chromatic light of wavelength $5500A^o$ incident normally on the slit of width$2x10^{-4}$cm , calculate the angular position of first and second minimum.

Q.11.Calculate intensity level of a fighter plane just leaving the runway having a sound intensity of about 100W/m^2. Given the threshold intensity= 10^{-12} W/m^2.

Q.12. A auditorium of volume 5500m^3 is found to have a reverberation time of 2.5 second. The sound absorbing surface of the auditorium has an area of 750 m^2 . calculate the average absorption coefficient of the auditorium.

Q.13. Calculate the reverberation time of hall with volume of 1500m^3 and total absorption is equivalent to 100 m^2 Sabine.

Q.14.The classroom has dimension 20x115x5m^3. The reverberation time is 3.5sec. Calculate the total absorption of its surface and the average absorption.

Q.15.The average reverberation time of hall is 1.5 sec and the area of the interior surface is 3340m^2. If the volume of the hall is 13000m^3. Find the absorption coefficient.

Q.16.A hall of dimensions 20x20x20m^3 has a reverberation time of 1.2 second. Find average absorption coefficient.

Q. 16. Calculate the natural frequency of ultrasonic waves using the following data. Thickness of the quartz plate = 5.5x10^{-3}m, Y= 8.0 x1010 N/m^2, p = 2.65 x 10^3 kg/m^3.

Q17. At what angle of incidence should a beam of sodium light be directed upon the surface of diamond to produce most complete polarization? . Critical angle for diamond is 24.5^0.

Q.18.Polariser and analyzer are with their directions parallel , so that the intensity of transmitted light is maximum. Through what angle should either be turned , so that the intensity be reduced to (i) ½ and (ii) 25% of the maximum intensity.

Q.18(a)Plane polarized passes through a positive double refracting crystal of thickness 40μm and emerges out as circularly polarized light. If the bifringence of the crystal is 4x10^{-5}, find the wavelength of the incident light.

Q.19.A retardation plate of thickness2.275x10^{-3} cm is cut with its faces parallel to optic axis . If the emergent beam of light is elliptically polarized. Find the wavelength of monochromatic light made incidentally normally on the plate. Given that μ_o = 1.586 μ_e = 1.592.

Q.20.Plane polarized light of wavelength 5x10^{-5} cm is incident on a piece of quarter cut to the optic axis . Find the least thickness of quarter for which the O-ray and E-ray combine to form plane polarized light.

Q.21.Sugar solution is kept in a 20 cm long tube. When plane polarized light is passed through the solution , its plane of polarization is rotated by 10^0. If the concentration of sugar solution is 0.07575, calculate the specific rotation of sugar.

Q.22. Calculate the specific rotation of sugar solution of 4.5% concentration, if the plane of polarization rotated through 6.8^o in passing through the length of 1.8 decimeter of the solution.

Q.23. How should the polarizer and analyzer be oriented to reduce the beam of light to i) 50% , ii) 25% of its original intensity,

Q.24.Calculate the conductivity of pure silicon at room temperature when the concentration of carriers is $1.6x10^{10}$per cm ^{3}. Take $\mu_e = 1500cm^2$/volt.sec. and $\mu_o = 500cm^2$/volt.sec.at room temperature.

Q.25.Calculate the conductivity of specimen if a donor impurity is added to an extent of one part in 10^8 Ge atoms at room temperature?

Q.26.A silver wire is in form of a ribbon 0.50 cm .Wide and 0.10mm thick. When a current of 2 amp passes through the ribbon , perpendicular to 0.80 tesla magnetic field, Calculate the Hall voltage produced. The density of silver 10.5grm/cc and atomic weight of Ag = 108.

Q.27.Caculate the mobility of charge carriers in a doped silicon whose conductivity is 100/ Ω - meter and the Hall coefficient isc$3.6x\ 10^{-4}$ m^3/ Coulomb.

Q. 28. Calculate the no of acceptors to be added to a germanium sample to obtain the resistivity of 10Ω cm. Given μ = 1700cm/volt second.

Q.29.The resistivity of copper wire of diameter 1.03 mm is 6.510 ohm/300m.The concentration of free electrons in is $8.4x10^{28}/m^3$. If current is 2A Find the mobility of free electrons.

Q.30. The hall coefficient of a doped Silicon is found to be $3.66x\ 10m^3$/C. The resistivity of the specimen is $8.93x10^3$.Ωm. Determine the mobility of the charge carriers.

Q. 31. A slab of silicon 2 cm is in length 1.5 cm wide and 2cm thick is applied with magnetic field of 0.4T along its thickness, When a current of 75A flows along the length , the voltage measured across the width is 0.81 mV, Calculate the concentration of mobile electrons in silicon.

Q.32 Calculate the number of acceptors to be added to a germanium sample to obtain the resitivity of 20Ω-cm, Given $\mu = 1700cm^2$/V. Sec.

Q 33. Calculate the number of accepters atom that needed to be doped in germanium sample to obtain the resistivity of 8Ω cm. (Given mobility $\mu = 1600cm^2$ /V-s)

Q 34. A sample of intrinsic germanium at room temperature has a carrier concentration $4.41x10^{22}cm^3$. Donor impurity is added in the ratio 1 donor atom per 10^8 atoms /cm^3 of germanium. Determine the resistivity of the material thus formed.

Q.35. A neutron is trapped in an infinite potential well of width 1 A^s. Calculate the values of energy and momentum in its ground state.