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magnetic field due to an infinite long straight conductor. Can the result for the infinite long straight conductor be used for a conductor of finite length?

Or

Derive the expression for force per unit length between two infinite current carrying conductors. Define one ampere current.

- b) A copper strip of 2cm wide and 1.0mm thick is placed in a magnetic field 1.5T. If a current of 200A is setup in the strip, calculate (i) Hall voltage and (ii) Hall mobility, if the number of electrons per unit volume is $8.4 \times 10^{28} \text{ m}^{-3}$ and resistivity is $1.72 \times 10^{-8} \Omega\text{-m}$.

Or

Calculate the magnetic force experienced by a current carrying conductor of length 'l' and cross sectional area 'A' when placed in a uniform magnetic field of strength 'B'.

5. a) Obtain all four Maxwell's Wave Equation in free space in terms of \vec{E} and \vec{B} . Write significance of each equation.
 b) An LC circuit is converted into an LCR circuit inserting a resistance of 10Ω . Calculate the percentage change in frequency in this conversion. Given: inductance = 10 mH and capacitance = $10 \mu\text{F}$.
 6. a) Describe about the principle of working of a optical fibre and its application.

Or

Write down the principles of laser action and explain the construction and working principle of He-Ne laser.

- b) Normalize the one dimensional wave function

$$\psi = A \sin\left(\frac{n\pi x}{a}\right), \quad 0 < x < a$$

$$\psi = 0, \quad \text{outside}$$

Or

An electron moving is a wave has wave function $\psi(x) = 2 \sin 2\pi x$. Find the probability of the electron forming in the region $x = 0.25$ to 0.5m .

7. Write short notes on *any two*:

- a) Band theory in solids
 b) Atomic view of resistivity
 c) Nicol Prism

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Physics

Semester: Spring

Year : 2014
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) Define the terms frequency and time period in SHM. Derive the time period of compound pendulum in terms of equivalent length of simple pendulum. 9
- b) A stretched string has a linear density 525g/m and is under tension 45N. We send a sinusoidal wave with a frequency 120Hz and amplitude 8.5mm along the string from one end. At what average rate does the wave transport energy? 6
- a) What is polarization of light? Explain the construction of calcite crystal and show how it produces double refraction. 9
- b) If the earth had a net charge equivalent to 1 electron/m² of surface area. 6
 - i. What will be the earth's potential?
 - ii. What would the electric field due to earth be just outside its surface?
- a) Define Biot-Savart law. Use it to find the magnetic field strength along the axis of circular current carrying loop. 9
- b) At some distance from transmitter of radio station, the magnetic field of electromagnetic wave emitted by radio station is found to be 1.6×10^{-4} T. If frequency of broadcast is 1020 KHz then find speed, wavelength and maximum electric field of electromagnetic wave. 6
- a) Discuss the charging and discharging phenomenon of a capacitor through resistor. 9
- b) What is the initial rate of increase of current and final saturation current in RD circuit with $L=15\text{mH}$, $R=24\text{ Ohm}$ and $\text{emf}=10\text{ volt}$? 6
- a) Write the Maxwell's equation in differential form and their 9

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significance. Using Maxwell's equations prove that $\frac{E_m}{B_m} = C$, Where
symbol carry usual meaning.

- b) A particle is moving in one dimensional box of infinite probability of finding the particle within the range 1°A at the centre of box when it is in lowest energy state.
6. a) Define solid in terms of band theory and discuss about knee voltage and breakdown voltage.
- b) Newton's ring are observed in reflected light of $\lambda = 5.9 \times 10^{-5} \text{cm}$. The diameter of 10th dark ring is 0.5cm. Find the radius of curvature of the lens and the thickness of air film.
7. Write short notes on: **(Any two)**
- a) Absorption co-efficient and reverberation.
- b) LASER and its application.
- c) Lorentz electromagnetic force.

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Attempt all the questions.

- a) What is S.H.M? Derive an expression for the period and radius of gyration of a compound pendulum and show that centre of oscillation and centre of suspension are interchangeable. 9
- b) Calculate the speed of transverse wave in a rope of length 20cm having 60gm of wire under a tension of 500N. 6
- a) Define coherent sources. Also, calculate the wavelength of light used with the help of Newton's ring experiment, when gap is filled with liquid of refractive index μ . 9
- b) The size of an empty assembly of bell has dimension $20 \times 15 \times 5 \text{ cm}^3$ and the reverberation time is 3.5 sec. What area of the wall should be covered by curtain cloth to reduce the reverberation time by 2.5 sec if the absorption coefficient of curtain cloth is 0.5. Also calculate the average absorption coefficient of the bell. 6

Or

The dispersive power of crown and flint glasses are 0.016 and 0.032 respectively. Calculate the focal lengths of the lenses made of crown and flint glasses which forms an achromatic doublet of equivalent focal length 20 cm when placed in contact.

- a) What is meant by electrostatic potential? Obtain expressions to evaluate electrostatic potential due to electric dipole and quadrupole 9
- b) Obtain the charging time constant of a capacitor in a RC circuit such that current through the resistor is decreased by 50% of its peak value in 5 seconds. 6

Or

Show that sound wave is a pressure wave.

- a) State Biot-Savart's Law and apply to calculate the flux density of 9