24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2067 Ashwin

Exam.	New Back (2066 Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Physics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *<u>All</u> questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. Define forced oscillation. Show that the total energy of the damped oscillation decreases with increasing time.

OR

Derive a differential equation for LC oscillation. Solve the equation and show that the maximum value of electric and magnetic energies stored in L.C. circuit are equal.

2. A meter stick swings about pivot point at one end, at distance 'h' from the stick's center of mass. Calculate the period of oscillation using parallel axis theorem.

3. Give an account of bad acoustic properties of a hall. Derive the expression for reverberation time in a good acoustics of a hall.

4. What are coherent sources? Describe a method for determining the refractive index of transparent liquid film using the interference phenomenon.

OR

Describe the construction of Nicol Prism. Explain how it can be used as polarizer and analyzer.

5. A diffraction grating is used at normal incidence. In such arrangement a green line (λ = 5400Å) of certain order is superimposed on the violet line (λ = 4050Å) of the next order. If the angle of diffraction is 30°, how many lines are there in 1 centimeter?

6. A light source emits light of two wavelengths 4300Å and 5100Å. The source is used in a double slit experiment. The distance between the sources and the screen is 1.5m and the distance between the slits is 0.025mm. Calculate the separation between the third order bright fringes due to these two wavelengths.

7. A thin convex and thin concave lens, each of focal length 50cm, are coaxially situated and separated by 10cm. Find the position and nature of the final image formed of an object placed 20cm from the convex lens.

8. What is population inversion? Explain the lasing action of a gas laser with necessary energy level diagram.

9. Consider a circular plastic disk of radius R that has a positive surface charge of uniform density on its upper surface. Find the electric field at any point at a distance x from the centre of the disk along its central axis.

OR

Define electric quadrupole. Calculate the electric potential of linear quadrupole of separation 2a at an axial distance r from its centre.

10. As a parallel plate capacitor with circular plates 20cm in diameter is being charged, the current density of the displacement current in the region between the plates is uniform and has a magnitude of $20A/m^2$. Calculate the magnitude of magnetic field (B) at a distance r = 50mm from the axis of symmetry of this region. Also calculate $\frac{dE}{dt}$ in this region.

11. Assuming that each atom of copper contributes one free electrons, calculate the drift velocity of free electrons in copper conductor of cross sectional area $10^{-4}m^2$ carrying a current of 200A. Given:

    Atomic weight of copper = 63.5 g/mol
    Density of copper = $8.94\times10^3 kg/m^3$
    Charge of an electron = $1.6\times10^{-19}C$

12. State Ampere's law. Use this law to find magnetic field that a current produces inside and outside a long straight wire of circular cross section.

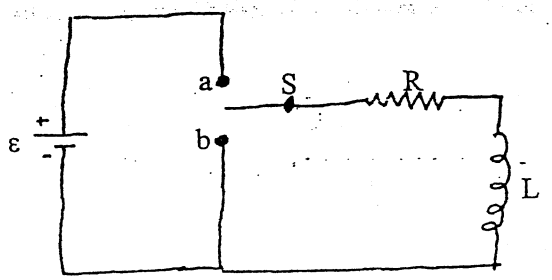
OR

Derive an expression for energy stared in an inductor. Show that the magnetic energy density is directly proportional to the square of the magnetic flux density. How can you compare electric energy density with this result?

13. A cyclotron which has the dees of radius 42cm and magnetic field of flux density 0.5 weber/m^2 is employed to accelerate protons. If the final velocity of the proton is 2.02×10^7m/sec, calculate the charge to mass ratio for the proton and the frequency of the alternating potential between the dees.

14. In the given figure, when switch S is closed on a, the current rises and approaches a limiting value $\frac{\varepsilon}{R}$.

    a) Find the current through the inductor as a function of time.
    b) When the switch is closed on b, the current reduces to zero. Find the rate of decay of current through the inductor.



15. State Maxwell equations in integral form. Convert them into differential form. Explain each of these equations.

16. Discuss the significance of the wave function and deduce the time independent Schrodinger equation.

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