24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later 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 *(SH402)*

- ✓ 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. Differentiate between bar pendulum and torsional pendulum. Using a torsional pendulum, derive a relation for modulus of rigidity of the metallic wire.

OR

Compare the damped and forced LCR oscillation. Derive the differential equation of forced em-oscillation and compare it with driven mechanical oscillation

2. Show that in a bar pendulum, minimum time period is achieved if radius of gyration is equal to the distance of point of suspension or point of oscillation from center of gravity.
3. Write some features of acoustically good auditorium. Derive Sabine's formula.
4. Two thin converging lenses of focal lengths 3 cm and 4 cm respectively are placed coaxially in air separated by a distance of 2 cm. An object is placed at 4 cm in front of first lens. Locate the positions of the principal points and final image.
5. What is polarization? Derive the relation for plane, elliptical and circular polarized light.

OR

What are the coherent sources of light? How such sources develop in lab? Show that the square of diameters of the n^{th} dark ring by the reflected light of Newton's ring is directly proportional to the natural number.

6. Define acceptance angle and numerical aperture. In an optical fiber, show that Numerical Aperture (NA) = $\mu_{core}\sqrt{(2\Delta)}$, symbols have their usual meanings.
7. In a Fraunhofer Single slit diffraction, a convex lens of focal length 20 cm is placed just after a slit of width 0.6 mm. If a plane wave of wavelength 6000A° falls on slit normally, calculate the separation between the second minima on either side of central maximum.
8. Calculate the minimum no of lines per cm in a 2.5 cm wide grating which will just resolve the sodium lines 5890 $\mathring{A}$ and 5896 $\mathring{A}$ in second order spectrum.
9. A thin ring made of plastic of radius R is uniformly charged with linear charge density λ. Calculate the electric field intensity at any point at an axial distance y from the center. If electron is constrained to be in axial line of the same ring, show that the motion of electron is SHM.

OR

Discuss the behavior of dielectrics in a parallel plate capacitor. Based on Gauss law of electrostatic in dielectric, show that $\vec{D} = \varepsilon_0 \vec{E} + \vec{P}$, where symbols have their usual meaning.

10. The potential in a region between $x = 0m$ and $x = 6m$ is $V = a + bx^2$ where a = 10 and b = -7V/m. Determine (i) the potentials at x = 0m, 3m and 6m and (ii) the magnitude and direction of electric fields at x = 0m, 3m and 6m.

11. What are the current density and mobility? Explain the atomic view of the resistivity and show that $\rho = \{m/ne^2\tau\}$, where symbols have their usual meanings.

12. Give general method of calculating capacitance of a capacitor. Use the method to calculate the capacitance of a spherical capacitor.

13. A toroid has number of turns 1250, internal radius 52 mm, external radius 95 mm and thickness of the ring 13 mm, calculate the inductance.

OR

A solenoid having an inductance of 6.3 μH is connected in series with a 1.2 kΩ resistance. If a 14 V battery is connected across the pair, how long will it take for the current through the resistor to reach 80% of its final value?

14. Explain Hall effect. What results you can draw from Hall experiment? Obtain an expression for the Hall voltage in a current carrying specimen placed in a magnetic field.

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

16. A free particle is confined in a box of width L. Using Schrodinger wave equation find an expression for energy eigen value.

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