

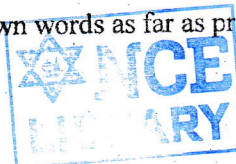
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BEI, BCT, BAM, BIE, BAG, BAS	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 **All** questions.
- ✓ **All** questions carry equal marks.
- ✓ Assume suitable data if necessary.



1. Derive the time period of physical pendulum. Show that its time period is minimum when length of pendulum is equal to radius of gyration.

OR

Derive a differential equation for LC oscillation. Show that the maximum values of electric and magnetic energies stored in LC circuit in equal.

2. A solid sphere of mass 3kg and diameter 0.20m is suspended on a wire. Find the period of angular oscillation for small displacements if the torsional constant of the wire is $6 \times 10^{-3} \text{ Nm/rad}$.
3. A string has linear mass density 530g/m and tension 50N. We send a sinusoidal wave with frequency 120Hz and amplitude 6.5mm along the string. At what average rate does the wave transport energy?
4. What are Newton's rings? Give the necessary theory for the determination of refractive index of liquid using Newton's ring method.

OR

What is double refraction? Show that linearly and circularly polarized light are the special cases of elliptically polarized light.

5. Light is incident normally on a grating 0.5cm wide with 2500 lines. Find the angular separation for the principle maxima of two sodium lines ($\lambda_1 = 589.0\text{nm}$ and $\lambda_2 = 589.6\text{nm}$) in the first order. Are the two lines resolved?
6. Show that diameter of the circle of least confusion is independent of the focal length of lens in the case when object is at infinity.
7. Two lenses of focal length +5.5cm and +4.5cm are separated by a finite distance. Find the position of principle points if the combination satisfies the condition of achromatism.
8. Define optical fiber. Derive the expressions for acceptance angle and numerical aperture of optical fiber.
9. Prove that the electric field due to a short dipole at a point on axial line is twice that on the equatorial line.

OR

Discuss Gauss's law in electrostatics. Find the electric field intensity at a point outside and inside the uniformly charged non-conducting sphere of radius R.

10. A capacitor of capacitance C is discharged through a resistor of resistance R . After how many time constants is the stored energy $\frac{1}{4}$ of its initial value.
11. Discuss a microscopic view of Ohm's law and show that resistivity of a conductor is independent of the external electric field.
12. Derive the expression of magnetic flux density at a point on the axis of a circular coil carrying current with N number of turns. Explain how the coil behaves for large distance.

OR

Show that the electrical energy density and the magnetic energy density are proportional to square of their corresponding fields.

13. Deuterons in cyclotron describe a circle of radius 0.32m just before emerging from dees. The frequency of the applied emf is 10 MHz . Find the flux density of the magnetic field and velocity of deuterons emerging out of the cyclotrons. (Mass of deuteron is $3.32 \times 10^{-27}\text{kg}$)
14. Find an expression of the self inductance of a toroid having N number of turns, radius r and carrying current i .
15. The maximum electric field 20m from an isotropic point source is 1.5V/m . Determine:
 - a) the maximum value of magnetic field
 - b) average intensity of light
 - c) power of the source
16. Prove that the energy levels are quantized, when an electron is confined in an infinite potential well of width a .
