24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
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 **All** questions.*
- ✓ ***All** questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. Distinguish between free and forced vibrations. Write the differential equation of forced oscillation. Determine the amplitude of oscillation for forced oscillation and hence explain sharpness of the resonance.

OR

Define simple harmonic motion. Show the average kinetic energy is half oft the total energy of a particle executing simple harmonic motion.

2. A 2μF capacitor is charged upto 50V. The battery is disconnected and 50mH coil is connected across the capacitor so that LC oscillation to occur. Calculate the maximum value of the current in the circuit.
3. The elastic limit of steel forming a piece of wire is equal to 2.70×10^8 Pa. What is the maximum speed at which transverse wave pulses can propagate along this wire without exceeding this stress? (density of steel = 7.89×10^3 kg/m^3)
4. What are Newton's rings? How can you use these rings to determine the refractive index of a given liquid?

OR

Discuss the phenomenon of Fraunhofer diffraction at a single slit. Show that the relative intensities of the successive maxima are $1:\frac{4}{9\pi^2}:\frac{4}{25\pi^2}$.....

5. Light of wavelength 6000 A falls normally on a thin wedge shaped film of refractive index 1.4, forming fringes that are 2 mm apart. Find the angle of the wedge.
6. If the plane of vibration of the incident beam makes an angle of 30° with the optic axis, compare the intensities of extraordinary and ordinary light.
7. Show that the diameter of circle of least confusion depends on the diameter of lens aperture and dispersive power of the material of the lens but is independent of the focal length of the lens.
8. An optical fiber has a numerical aperture of 0.22 and core refractive index 1.62. Determine the acceptance angle for the fiber in a liquid which has a refractive index of 1.25. Also, determine the fractional refractive index change.

9. Prove that electric field due to a short dipole at axial point is twice that at equatorial point.
10. A capacitor of capacitance C is discharging through a resistor of resistance R. After how many time constants is the stored energy 1/8 of its initial value?
11. Give a general method to calculate electric field and potential due to continuous charge distribution. Using your method, calculate electric field at an equitorial distance y due to a long charged rod having linear charge density λ.
12. Consider a circular coil of radius R carrying current I. Find the magnetic field at any point on the axis of the loop at a distance z from the center of the loop. Show that the circular current carrying coil behaves as a magnetic dipole for large distance.
13. In a Hall Effect experiment, a current of 3.2A lengthwise in a conductor 1.2 cm wide, 4.0 cm long and 9.5μm thick produces a transverse Hall voltage (across the width) of 40μV when a magnetic field of 1.4T is passed perpendicularly through the thin conductor. From this date, find (a) the drift velocity of the charge carriers and (b) the number density of charge carriers.
14. Derive an expression for growth and decay of current in LR circuit. Explain inductive time constant by sketching graph between current and time for both cases.

OR

Derive expressions for inductance of a Solenoid and Teroid. Then show that inductance is the property of the coil.

15. Write and explain Ampere's law in magnetism. How Maxwell modified it. Based on this modified equation, explain the term displacement current. Prove displacement current is equal to conduction current.
16. Explain Schrodinger's wave equation. Derive time independent Schrodinger wave equation. Use this equation to find energy for a particle in a box of infinite square well potential.

***