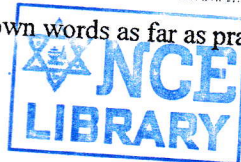


TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular	
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 (SH 402)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. Define centers of suspension and oscillation of a compound and show that they are interchangeable. Find the expression for minimum time period. [2+2+1]

OR

Define EM oscillation. Compare it with Mechanical Oscillation. Develop a relation of frequency of LC oscillation for under damped condition. [1+2+2]

2. A 750 gm block oscillates on the end of a spring whose force constant is 56 N/m. The mass moves in a fluid of damping const 0.162 Ns/m. Find the period of oscillation. [5]
3. A room has dimension 5m × 4m × 4m. Find (i) the mean free path of the sound wave in the room. (ii) No. of reflection made/sec by sound waves with the walls of the room. Given the velocity of sound in air is 350 m/sec. [5]
4. What is the power of combination of lenses of focal lengths 50 cm and 10 cm which are separated by 10 cm? [5]
5. Explain briefly, with well-labeled ray diagram, the diffraction at single slit. Show that the intensity of first maxima is 4.54% of intensity of central maxima. [2+3]

OR

What is Nicol prism? How can linearly, circularly and elliptically polarized light be produced? Derive the relation. [2+3]

6. What is Newton's ring? Describe a necessary theory of Newton's rings method for the determination of wavelength of light. [1+4]
7. Calculate the minimum number of lines in a grating which will just resolve the sodium lines in the first order spectrum. The wavelengths are 5890 Å and 5896 Å. [5]
8. Starting from energy level diagram, explain how lasers can be produced by Helium-Neon gas. [5]
9. What is an electric quadrupole? Calculate potential for points on the axis of the quadrupole. [1+4]

OR

Find the electric field at a distance z above the center of a flat circular disc of radius R which carries a uniform surface charge density σ . What does your formula give in the limit $R \rightarrow \infty$? [4+1]

10. A long cylindrical conductor has length 1 m and is surrounded by a coaxial cylindrical conducting shell with inner radius double that of long cylindrical conductor. Calculate the capacitance for this capacitor assuming that is vacuum in space between cylinders. [5]
11. State Gauss Law of electrostatics. Show that electric field intensity at the surface of infinitely long non-conducting cylindrical symmetric uniform charge distribution is maximum. [1+4]

12. Calculate the mean free path and mean free time between collisions for the conduction electrons in copper having electron density $8.5 \times 10^{22}/\text{cm}^3$ and resistivity $1.7 \times 10^{-8} \Omega\text{m}$. Given: charge of an electron = $1.6 \times 10^{19}\text{C}$, mass of an electron = $9.1 \times 10^{-31}\text{kg}$ and speed of an electron = $1.6 \times 10^6\text{m/s}$.

[5]

13. Compare the methods of Biot and Savart law and Ampere's law to calculate magnetic fields due to current carrying conductor. Calculate magnetic field at an axial distance 'x' from the center of the circular coil carrying current.

[2+3]

OR

Explain Hall Effect. Derive an expression for Hall coefficient for an electron.

[1+4]

14. In a LR circuit, the current builds up to 20% of its steady state value in 3 sec. What is the inductive time constant?

[5]

15. Prove that $\frac{E}{B} = \frac{1}{\sqrt{\mu_0\epsilon_0}}$ where E is electric field, B is magnetic field; μ_0 and ϵ_0 are the permeability and permittivity of free space.

[5]

16. A beam of electrons having energy of each 3eV is incident on a potential barrier of finite height 4eV. If the width of the barrier is 1 nm, calculate the percentage transmission of the beam through barrier.

[5]
