TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2076 Chaitra

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

1. Define point of suspension & oscillation of bar pendulum & show that they are interchangeable. Also show that the time period will be minimum, when these points are equidistance from centre of gravity.

   Or,

   What is damped oscillation? Develop a relation for damped frequency in LCR oscillation. Hence discuss the underdamped, overdamped and critically damped oscillations.

2. In an oscillation, the amplitude drops to 1/e of its original amplitude in 50sec. Find the relaxation time. Also, obtain the time required to drop the amplitude to $1/e^2$ of the original amplitude.

3. The reyerberation time for an empty hall is 1.5 sec. With 500 audiences present in the hall, the reverberation time falls to 1.4 secs. Find the number of persons present in the hall if the reverberation time falls to 1.312 sec.

4. A coaxial lens system placed in air has two lens of focal length 36cm & 12cm separated by a distance 24cm. Find the position of the cardinal points.

5. What is Newton's Ring? How can it be used to determine the refractive index of the liquid?

   Or,

   Discuss the similarities & difference of Young's double slit interference & single slit diffraction. Interrelate the discussion to explain the formation of spectra by diffraction in a single slit.

6. Show the intensity in the first and second order in a single slit diffraction reduced approximately to 4.5% and 1.6% of its central maxima.

7. Two polarizing sheets are placed together with their transmission axes crossed. A third sheet is inserted between them with its transmission axis at an angle of 45° with respect to each of the other axes. Find the fraction of incident unpolarised light intensity transmitted by the combination.

8. What is the fiber optics? Discuss the physics behind the optical fiber transmission. Derive an expression for acceptance angle of an optical fiber.

9. Define electric quadrupole and quadrupole moment. Hence, determine the expression for electric field intensity due to the quadrupole at axial line.

   Or,

   State and prove the Gauss's law in electrostatics. Apply this law to determine the electric field intensity at a point inside the uniformly charged non conducting solid sphere.

10. A parallel plate capacitor each of area $100cm^2$ has potential difference of 50V and capacitance 100pF, if a mica of dielectric constant 5.4 is inserted between plate, find the magnitude of
    a) Electric field intensity
    b) Displacement vector
    c) Polarization vector
11. Define Faraday's laws of electromagnetic induction and Lenz's law. Obtain an expression for self inductance of toroid.
12. If the carrier density of intrinsic Germanium at 300K is $2.29\times10^{13}/cm^3$. Calculate the resistivity at the same temperature given that electron & hole mobilities are $0.39m^2v^{-1}s^{-1}$ & $0.19m^2v^{-1}s^{-1}$ respectively.
13. Compare Biot-Savart law with Amper's law. Calculate the magnetic field outside & inside due to a long, straight wire of radius R carrying a steady currrent 'I' that is uniformly distributed through the cross-section of the wire.
14. A long solenoid of radius 2cm has 1×10^3 turns per meter and carries a sinusoidally varying current $I=5\sin100\pi t$, where I is in ampere & t is in second. Determine the magnitude of induced electric field at a radius r=1 cm & r = 3 cm from its central axis.
15. What is Displacement current? Define and derive the relation of poynting vector in electromagnetism.
16. An electron with an energy of 8eV is incident on a potential barrier which is 9.2eV high & 0.2 nm wide.
    a) what is the maximum transmission coefficient that the electron will pass through the barrier?
    b) what is the probability of transmission that the electron will pass through the barrier.

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