24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	All	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. Differentiate between linear and angular harmonic motion. Show that the motion of torsion pendulum is angular harmonic motion. Also find its time period.

OR

Derive the differential equation of the forced oscillation of LCR circuit with an AC source and find the expression for the current amplitude. Hence explain the condition of current resonance in such circuit.

2. A 750g block oscillates on the end of a spring whose force constant, k=56N/m. The mass moves in a fluid which offers a resistive force F = -bv, where b = 0.162Ns/m. What is the period of the oscillation?

3. A room has dimensions 6m×4m×5m. Find:
   i) Mean free path of sound wave in the room
   ii) The number of reflections made persecond by the sound wave with the walls of the room. (Take velocity of sound in air= $350ms^{-1}$).

4. Define interference. Show that interference in thin film due to reflected and transmitted lights are complementary.

OR

What are Newton's rings? How can you determine the refractive index of given liquid using Newton's rings experiment?

5. Explain the dispersive and resolving power of a diffraction grating. Derive expressions and develop a relation between them.

6. A 200mm long tube containing $48cm^3$ of sugar solution produces an optical rotation of 11° when placed on a saccharimeter. If the specific rotation of sugar solution is 66°, calculate the quantity of sugar contained in the tube in the form of solution.

7. Prove that the condition for achromatism for the combination of two lenses of focal length f_1 and f_2 having dispersive power ω_1 and ω_2 placed at a separate distance x is $(\omega_1/f_1)+(\omega_2/f_2)=(x/f_1f_2)(\omega_1+\omega_2)$.

8. Differentiate between spontaneous and stimulated emission of radiation. Explain the construction and working of He-Ne laser with a suitable energy level diagram.

9. Derive an expression for the electric field at a point P at a distance X from a circular plastic disc of radius a along its central axis. Does this expression for E reduces to an expected result for x>>a?

10. A capacitor of capacitance 'C' is discharged through a resistor of resistance 'R'. After how many time constants is the energy stored becomes one fourth of initial value?

11. Calculate the electric field due to a uniformly charged rod of length l at a point along its long axis at a distance 'a' from its nearest end.

12. Explain the principle and working of cyclotron. Show that the time spent by the particle in a Dee is independent of its speed and radius of its circular path.

OR

Use Biot- Savart Law to calculate magnetic field on the axial line of a current carrying circular loop. Explain how the coil behaves for a large distance point.

13. A cooper strip 150μm thick is placed in a magnetic field of strength 0.65T perpendicular to the plane of the strip and current of 23Amp is set up in the strip. Calculate: (i) the Hall voltage (ii) Hall coefficient and (iii) Hall mobility, if the number of electrons per unit volume is $8.5\times10^{28}/m^3$ and resistivity is 1.72×10^{-8} Ohm-m.

14. A parallel plate capacitor with circular plates of 10cm radius is charged producing uniform displacement current of magnitude $20A/m^2$. Calculate (i) dE/dt in the region (ii) Displacement current density and (iii) Induced magnetic field.

15. Obtain an expression for energy transfer rate by electromagnetic wave. From your result show that $I \alpha E^2_{rms}$. Where I is the intensity em wave and E_{rms} is root mean square value of electric field.

16. Derive the schrodinger time independent wave equation. Also what do you mean by a potential barrier?

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