24R TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 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. Point out the similarities and dissimilarities between the oscillations of bar pendulum and torsinal poendulum. Show that the radius of gyration is equal to distance from center of suspension to center of gravity of compound pendulum, when time period in minimum.
2. Derive a differential equation for LC Oscillation. Show that the maximum value of electric and magnetic energies stored in LC circuit is equal.

OR

Prove that if a transverse wave is travelling along a string, then the slope at any point of the string is numerically equal to the ratio of the particle speed to the wave speed at that point.

3. The time of reverberation of an empty hall is 1.5 sec with 500 audiences present in the hall, the reverberation time falls to 1.4sec. Find the no. of persons present in the hall if the reverberation time falls down to 1.32 sec.
4. Show that the intensity of the first subsidiary maxima of Fraunhoffer's diffraction at a single slit is 4.5% of that or principal maxima.

OR

What is double diffraction? Explain how Nicol prism can be used as polarizer and analyzer?

5. In a Newton's ring experiment, the radius of curvature of the lens is 5cm and the lens diameter is 20mm. (a) How many bright rings are produced? Assume that λ=589nm (b) How many bright rings would be produced if the arrangement were immersed in water (μ=1.33)?
6. A diffraction gratting 3cm wide produces the second order at 33° with light of wavelength 600nm. What is the total number of lines on the gratting.
7. What is population inversion? Explain why laser action cannot occur without population inversion between atomic levels?
8. What are cardinal points of an optical system? Determine the equivalent focal length of a combination of two thin lenses separated by a finite distances.
9. A ring has a charge q uniform distributed in it. Derive an expression for the electric field at any point on the axial line of the ring. Extend your result to find the potential.

OR

Write an expression for electric field at any point in the axial line of a charged ring. Using this equation, calculate the electric field at any point in the axial line of a charged disk.

10. What is the magnitude of the electric field at the point (3,2) m if the electric potential is given by $V = 2x+5xy+3y^2$ volts. What acceleration does an electron experiences in the x-direction.

11. Derive an equation $\vec{J} = \sigma \vec{E}$. Explain why resistivity of a conductor increases with increasing temperature plot a graph between R_θ (Resistance at any temperature θ) and temperature. Based on the graph, explain what are superconductor? How they differ from perfect conductor? Describe the characteristics of superconductor.

12. Derive an expression for energy stored in magnetic field. Show that the energy stored per unit volume is directly proportional to the square of the magnetic flux density. Compare this result with electric energy density.

OR

What is self induction? Define inductance of a coil. Show by calculation inductance of a coil depends on the permeability of a medium and the geometry of the coil.

13. A long circuit coil consisting of 50 turns with diameter 1.2m carries a current of 10Amp. (a) Find the magnetic field at a point along the axis 90cm from the center. (b) At what distance from the center, along the axis, the field is 1/8 greater as at the center.

14. Describe the principal and working of Cyclotron. Show that the time taken by the ion in a Dee to travel a semicircle is exactly same whatever be its radius and velocity.

15. Write Maxwell's equations in free space and dielectric medium. With the help of Maxwell's equations, Derive charge conservation theorem.

16. A beam of electrons having energy of each 3eV is incident on a potential barrier of height 4eV. If the width of the barrier is 20A°, calculate the transmission coefficient of the beam through the barrier.

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