24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BAME, 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. Write the differences between mechanical oscillation and e.m. oscillation. Set up the differential equation of damped harmonic mechanical oscillation. Obtain the relation for frequency of such oscillation. Hence explain the conditions for different types of damped oscillation

OR

Define sharpness of resonance. Derive the relation for current amplitude of forced e-m oscillation.

2. What are the measures of good acoustic building? Show that the reverberation time decrease with increase in absorbing factors in a hall.
3. Two thin lenses of focal length f1 and f2 separated by a distance having an equivalent focal length 50 cm. The combination satisfies the condition for no chromatic aberration and minimum spherical aberration. Find the separation between the two lenses if both lenses are of same materials.
4. Prove that the intensity of first maxima is 4.54% of the central maxima in Fraunhoffer's single slit diffraction.

OR

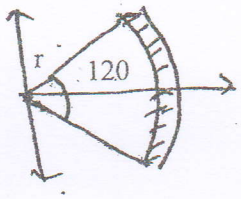
Write the physical meaning of dispersive power and resolving power of grating. Show that resolving power is directly proportional to the total number of rulings on the grating.

5. Newton's Rings arrangement is used with a source emitting two wavelength λ_1 and λ_2. It is found that the n^{th} dark ring due to λ_1 coincides with (n+1)th dark ring to λ_2. Find the diameter of n^{th} dark ring. ($\lambda_1 = 6\times10^{-5}$ cm, $\lambda_2 = 5.9\times10^{-5}$ cm radius of curvature of the lens R = 90 cm).
6. A quartz crystal has refractive indices 1.553 and 1.544. Calculate the thickness of a quarter wave plate for sodium light of wavelength 5890A°.
7. Explain the terms stimulated emission, population inversion, optical pumpling and metastable. Explain working principle of He-Nellaser.
8. A heavy circular ring of radius R oscillates in a vertical plane about a horizontal axis at a distance x from the center. Show that the time period is minimum when x = R

9. Derive the relation for potential at any point due to an electric dipole and show that no work is done in bringing a charge from infinity to dipole along the perpendicular bisector of the dipole.

OR

A plastic rod contains uniformly distributed Q charge. The rod has been bent in 120° circular arc of radius 'r' as shown in figure below. Prove that the electric field intensity at the center of bent rod is $E = \frac{0.83Q}{4\pi\varepsilon_0 r^2}$



10. Derive the relation for rise and fall of current in charging and discharging of capacitor through resistor. Plot graphs between current and time and explain the figures.
11. The space between two concentric conducting spherical shells of radii b = 1.70 cm and a = 1.70 cm and a = 1.20 cm is filled with a substance of dielectric constant k = 23.5. A potential difference V = 73 V is applied across the inner and outer shells. Determine (a) the capacitance of the device (b) the free charge q on the inner shell.
12. What is Hall-effect? Derive an expression for the Hall coefficient and established the relation between mobility of charge carrier and conductivity of material of wire.

OR

Derive a relation resistivity of a conductor using microscopic view. From your result, explain why resistivity of a conductor increase with necessary with increasing temperature.

13. Explain the phenomenon of self induction. Calculate the value of inductance for (a) long solenoid and (b) Toroid.
14. What is Ampere's law? Derive the expression for magnetic flux density outside and inside a long straight conductor carrying current I.
15. Define Poynting vector. Prove that $\vec{S} = \left(\vec{E} \times \vec{B}\right)/\mu_o$, where the symbols have their usual meanings.
16. Discuss the significance of the wave function and deduce the time independent Schrodinger's wave equation.

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