TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.		**Back**	
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. Derive an expression for the time period of a physical pendulum and establish the interchangeability of the center of oscillation and suspension.

OR

Give the necessary theory of forced electromagnetic oscillation and deduce the condition for resonance amplitude in LCR series circuit with ac source.

2. Write down the characteristics of simple harmonic progressive wave. Derive an expression of energy of a progressive wave.

3. A spring is stretched by 5 cm when a load of 1kg is suspended to the lower and (upper end of spring is fixed). What will be the maximum velocity of object if it is pulled down further by 5cm form equilibrium position and then released?

4. Two thin lenses of focal lengths f_1 and f_2 separated by a distance d have an equivalent focal length 0.3m and both lenses are of same material. The combination of lenses satisfies the condition of achromatism and minimization of spherical aberration. Find the value of f_1 and f_2.

5. Explain the formation of Newton's ring in reflected system of monochromatic light. Prove that in reflected light diameters of the dark rings are proportional to the square root of natural numbers.

OR

What is double refraction of light? Using the concept of double refraction, show that the plane polarized light and circularly polarized light are the special cases of elliptically polarized light.

6. A plane transmission grating of width 6 cm has 5000 lines/cm. Find the resolving power of grating for second order spectrum and the smallest wavelength difference that can be resolved for light of wavelength 5000 Å.

7. A plano-convex lens of radius 300 cm is placed on an optically flat glass plate and is illuminated by monochromatic light. The diameter of the 8th dark ring in the transmitted system is 0.72 cm. Calculate the wavelength of light used.

8. Differentiate between LASER and white light. Why the light in He-Ne laser is produced from Neon and not form Helium?

9. A ring shaped conductor with radius R carries a charge q uniformly distributed around it. Find the electric field intensity at an axial point of ring at distance y form the centre.

OR

Define capacitance. Give a general method to calculate capacitance of a capacitor. Find expression for the capacitance of a cylindrical capacitor.

10. An electric dipole consists of charges 10µC and -10µC separated by a distance of 1mm. What is the maximum torque experienced by the dipole if placed in the uniform electric field of intensity 400 V/cm?

11. Calculate the (i) mean free time and (ii) mean free path between collisions for the conduction electrons in copper having electron density 8.5×10^{28} /m^3 and resistivity 1.7×10^{-8} Ωm. Charge of electron 1.6×10^{-19} C, mass of electron 9.1×10^{-31} kg, effective speed of electron 1.6×10^6 m/s.

12. Using Ampere's law, calculate the magnetic field inside, outside and on the surface of a long current carrying conductor and hence plot a graph between the magnetic field and the distance from the center of the conductor.

OR

Show that the energy per unit volume in an electric field and magnetic field are proportional to the square of their fields.

13. A series circuit has 25 ohm resistance and 0.1 henry inductance. What will be initial rate of increase of current if the circuit contains a 12V steady source? What time is required for the current to attain a value of 100mA?

14. A wire of length L carries a current I. If the wire is formed into a circular coil, then the maximum torque in a given magnetic field B developed for a single turn is $\tau = \left(\dfrac{1}{4\pi}\right) L^2 IB$

15. Write Maxwell's equations in integral form. Convert them into differential form.

16. An electron is confined to an infinite potential well of size 8.5 nm. Calculate the ground state energy of the electron and radian frequency. Given: Plank's constant = 6.62×10^{-34} Js, mass of electron = 9.1×10^{-31} kg.

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