14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BAME, 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.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1) Deduce the time period of a simple harmonic vibration. Explain why a loaded bus is more comfortable than an empty bus. (3+2)

2) Explain forced oscillation with its differential equation. Write the relation for the frequency dependent amplitude and hence give a rough sketch of the resonance curve. (3+2)

Or

Calculate the average amplitude of a sinusoidal sound wave in air of a frequency of 1.5 KHz and average intensity 10-5W/cm^2, where density of air is 1.29kg/m^3. (5)

3) Give an account of bad acoustic properties of a hall and discuss the method to improve these defects. (5)

4) Explain the physical meaning of Dispersive and resolving powers of a Grating. Two spectral lines have wavelengths λ and $\lambda+\Delta\lambda$ respectively where $\Delta\lambda << \lambda$. Show that their angular separation $\Delta\theta$ in a grating spectrometer is $\Delta\theta = \frac{\Delta\lambda}{\sqrt{\left(\frac{d}{m}\right)^2 - \lambda^2}}$, where 'd' and 'm' are grating elements and no. of order respectively. (2+3)

Or

In newton's ring experiment, "Central spot is dark in reflected system" and "Fringes get closer as the no. of order increased" explain. Is it possible to make central spot bright in reflected system? If so how? (3+2)

5) A soap film $5*10^{-5}$ cm thick is viewed at an angle of 35° to the normal. Find the wavelength of the visible light which will be absent from the reflected light. (5)

6) Light of wavelength 580nm falls on a calcite crystal of certain thickness. The emerging light is circularly polarized. What must be the thickness of such crystal? (5)

7) Calculate the focal length of combination of two thin lenses of focal length f_1 and f_2 separated by a distance'd'. Find the position of two principal points. (5)

8) Trace the ray diagram that shows the propagation of light through the step and graded index optical fiber. Write the importance of self-focusing in an optical fiber. (3+2)

9) Charge of uniform density $\rho=3.2\mu C/m^2$ fills a non-conducting solid sphere of radius of 5.0 cm. What is the magnitude of the electric field a) at 3.5 cm b) 8.0 cm from the sphere's center (5)

Or

Two large parallel plates are separated by a distance of 5cm. The plates have equal but opposite charges that create an electric field in the region between the plates. An alpha particle ($q= 3.2*10^{-19}$ C, $m= 6.68*10^{-27}$kg) is released from the positively charged plate, and it strikes the negatively charged plate $2*10^{-6}$ sec later. Assuming that the electric field between plates is uniform and perpendicular to the plates, what is the strength of electric field? (5)

10) Calculate the potential at a point due to a uniform line of charge of length L at a distance D from its one end which lies in the perpendicular line. (5)

11) Explain how electric energy is stored in a capacitor and derive an expression for energy density of electric field. (2+3)

12) Explain super conductivity and its types with examples. Write the difference(s) between super conductor and perfect conductor. (3+2)

13) If a test charge revolves round a circular path of radius 8.5cm where the magnetic field increases at steady rate 0.13T/s, calculate the magnitude of induced electric field at a point 12.5 cm? (5)

14) Derive expression for inductances of a solenoid and toroid. Then show that inductance is the property of the coil. (5)

Or

What is Hall Effect? Write its importance. Show that the hall coefficient $R_H = -1/ne$, where the symbols have their own meanings. (1+1+3)

15) The Sun delivers about $10^3 W/m^2$ of energy to the earth's surface through EM radiation calculate a) the total power incident on a roof of dimensions 8m *20 m. b) Radiation pressure and force exerted on the roof, assuming roof is perfect absorber. (2+3)

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 20nm, calculate the percentage transmission of the beam through the barrier. (5)

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