

Nov-Dec-2012



[4261] – 103 A

Seat No.	
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F.E. (Semeter – I) Examination, 2012
APPLIED SCIENCE – I
(Physics) (2008 Pattern)

Time : 2 Hours

Total Marks : 50

- Instructions :** 1) Neat diagrams must be drawn **wherever** necessary.
2) Black figures to the **right** indicate **full** marks.
3) You are advised to attempt not more than **3** questions.
4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.
5) Assume suitable data, if necessary.

1. a) A thin film is illuminated by monochromatic light. Obtain the condition of darkness and brightness of the film as observed in reflected light. Why the colours are formed in the reflected light ? 7
- b) Explain electrostatic focussing and a neat diagram of electrostatic lens. 6
- c) White light falls at an angle of 45° on a parallel soap film of refractive index 1.33. At what minimum thickness of the film will it appear bright yellow of wavelength 5900 \AA in the reflected light ? 4

OR

2. a) Draw neat diagram of Michelsons interferometer. Explain how it used for
 - a) the determination of wavelength of light
 - b) thickness of thin transparent film. 7
- b) Explain with a neat diagram the principle, construction and working of a Bainbridge Mass Spectrograph. 6
- c) In Newton's rings experiment the diameters of n^{th} and $(n + 8)^{\text{th}}$ bright rings are 4.2 mm and 7.00 mm respectively. Radius of curvature of the lower surface of the lens is 2.00 m. Calculate the wavelength of the light used. 4

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3. a) Explain Fraunhofer diffraction due to a single slit and obtain an expression for resultant amplitude of diffraction pattern, the conditions of principal maximum and minima. 7
- b) How the ultrasonic waves are detected by acoustic diffraction method, explain with neat and labeled diagram ? 6
- c) A diffraction grating is used for the resolution of two wavelength. If the wavelength difference is 1.8 \AA at $\lambda = 6553 \text{ \AA}$. Calculate the minimum number of lines that a diffraction grating would need to have in order to resolve in first order the red doublet given by a mixture of hydrogen and deuterium. 4

OR

4. a) Give the theory of a plane diffraction grating and obtain the condition for n^{th} order maximum and minimum. 7
- b) Explain the use of ultrasonic waves for
- i) The detection of flow in metals. 4
 - ii) Depth sounding. 2
- c) Find the half angular width of the central maximum in the Fraunhofer diffraction pattern of a slit of width $12 \times 10^{-5} \text{ cm}$, when illuminated by light of wavelength 6000 \AA . 4
5. a) Explain the production of plane polarised light by refraction (pile of plates). 6
- b) Explain principle construction and working of a cyclotron. Obtain the expression for the cyclotron resonance frequency and the maximum energy of the particle. 6
- c) Calculate the specific rotation, which rotates the plane of polarization 15.2° in 20% sugar solution of 25 cm length. 4

OR

6. a) What are polaroids ? Explain the construction of polaroids and its uses. 6
- b) What is stellar energy ? Define nuclear fusion and give an account of Carbon-Nitrogen cycle. 6
- c) A quarter wave plate of thickness $2.275 \times 10^{-3} \text{ cm}$ is cut with its faces parallel to the optic axis. The emergent beam of light is elliptically polarised. Find the wavelength of monochromatic light made incident normally on the plate .

[Given $\mu_o = 1.586$, $\mu_e = 1.592$]. 4