

UNIVERSITY OF PUNE
[4361]-03
F. E. (Semester-I) Examination-2013,
APPLIED SCIENCE-I (PHYSICS)
(2008 Course)

Total No. of Questions : 6 [Total No. of Printed Pages :6]
[Time : 2 Hours] [Max. Marks : 50]

Instructions : (1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.

(2) Neat diagram must be drawn wherever necessary.

(3) Black figures to the right indicate full marks.

(4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(5) Assume suitable data, if necessary.

Constants: $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{sec}$
 $c = 3 \times 10^8 \text{ m/s}$
 $e = 1.6 \times 10^{-19} \text{ C}$
 $m_e = 9.1 \times 10^{-31} \text{ kg}$

Q1.

- a) With the help of neat labeled diagram explain the principle, construction and working of Michelson's interferometer, Discuss the types of fringes. [7]
- b) Obtain an expression for the displacement when a transverse magnetic field acts on an electron in a limited region [6]
- c) A parallel beam of light $\lambda = 5890 \text{ \AA}$ is incident on a glass plate ($\mu = 1.5$) such that angle of refraction into plate is 60° . Calculate the smallest thickness of the plate which will make it appear dark by reflection. [4]

OR

Q2.

- a) What is velocity selector? How this principle is used in Bainbridge mass spectrograph to determine the mass of the isotopes? [7]
- b) A thin film of uniform thickness is illuminated by monochromatic light. Obtain the conditions of darkness and brightness of the film as observed in reflected light [6]
- c) Electrons accelerated by a potential difference of 150 volt enter in an electric field at an angle of 50° with normal to the interface of the higher potential and get refracted at an angle of 35° with the normal. Find the potential difference between the two regions. [4]

Q3.

- a) Explain the Fraunhofer diffraction at a single slit and obtain the condition for principal maximum and minima. Draw the intensity distribution curve. [7]
- b) What is Piezo-electric Effect? Describe with a neat diagram the Piezo-electric oscillator for generating the ultrasonic waves [6]
- c) How many orders will be visible if the wavelength of the incident light is 6000\AA and the number of lines n the grating is 5.0×10^3 lines per cm. [4]

OR

Q4.

- a) What is Ultrasonics? Explain magnetostriction oscillator for production of ultrasonic waves. [7]
- b) State Rayleigh's criterion of resolution hence obtain an expression for the resolving power of grating [6]
- c) An ultrasonic pulse of frequency 80KHZ is sent down towards the seabed. The echo is recorded after 0.7 sec. if the velocity of sound in sea water is 1500 m/s calculate the depth of the sea and the wave length of the pulse [4]

Q5.

- a) Distinguish between polarized and unpolarised light. Describe the process of production and defection of elliptically polarized light. [6]
- b) With the help of a neat labelled diagram, explain, construction and working of a cyclotron. Obtain the expression for cyclotron frequency and maximum energy of the particle. [6]
- c) Calculate thickness of a mica plate required to make a quarter wave plate and half wave plate for light of wavelength 5890\AA . [4]
Given: $\mu_o=1.586$ and $\mu_e=1.592$

OR

Q6.

- a) What is meant by nuclear fusion? Give an account of carbon-nitrogen cycle in fusion reaction. [6]
- b) Explain the term double refraction and hence explain the phenomenon of it on the basis of Huygen's wave theory [6]
- c) In a betatron the maximum magnetic field transversing the electron orbit is 0.8 wb/m². The operating frequency of it is 50HZ and the stable orbit diameter is 0.8m . calculate the average energy gained per revolution and the final energy of electron assuming maximum possible time for acceleratetion . [4]