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[4756]-13

F.E. (First Semester) EXAMINATION, 2015

APPLIED SCIENCE—I (PHYSICS)

(2008 COURSE)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. No. 1 *or* Q. No. 2, Q. No. 3 *or* Q. No. 4,
Q. No. 5 *or* Q. No. 6.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of electronic calculator, Mollier chart, steam tables
are allowed.

(v) Assume suitable data, if necessary.

Constant :

$$h = 6.63 \times 10^{-34} \text{ J-s}$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

1. (a) With the help of neat labeled diagram explain the principle,
construction and working of Michelson Interferometer. [7]

P.T.O.

- (b) Obtain an expression for the displacement when a transverse magnetic field acts on an electron in a limited region. [6]
- (c) In Newton's ring experiment the diameter of 4th and 12th dark rings are 0.40 cm and 0.70 cm. Find the diameter of 12th dark ring. [4]

Or

2. (a) Explain with neat diagram how Bainbridge Mass Spectrograph is used to determine the mass of the isotopes. [7]
 - (b) Derive the condition of maxima and minima when light incident on thin parallel film of uniform thickness in reflected system. [6]
 - (c) An electron is accelerated through a potential difference of 5 KV and enter in a uniform magnetic field of 0.02 Wb/m^2 acting normal to the direction of electron motion. Determine the radius of the path. [4]
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3. (a) Explain Fraunhofer diffraction at a single slit and derive the condition of maxima and minima. [7]
 - (b) Define magnetostriction effect. Explain with neat circuit diagram how magnetostriction oscillator is used to generate ultrasonic waves. [6]

- (c) What is the maximum wavelength that can be observed in the fourth order for a transmission grating having 5000 lines per cm ? [4]

Or

4. (a) What is Ultrasonics ? Explain Echo sounding and non-destructive testing using Ultrasonics. [7]
- (b) Explain Rayleigh's criteria of resolution and hence obtain the expression for the resolving power of grating. [6]
- (c) Calculate the nature frequency of ultrasonic waves using the following data : the thickness of quartz plate = 5.5×10^{-3} m, $Y = 8.0 \times 10^{10}$ N/m², $\rho = 2.65 \times 10^3$ kg/m³. [4]
5. (a) Define double refracting crystal. Explain Huygen's theory of double refracting crystal. [6]
- (b) With the help of neat labeled diagram explain the construction and working of Betatron, also derive Betatron condition. [6]
- (c) Calculate the thickness of Quarter wave plate and half wave plate from the following data : [4]

$$\mu_e = 1.592, \mu_o = 1.586, \lambda = 5890 \text{ \AA}.$$

Or

6. (a) Define nuclear fusion. Describe carbon-nitrogen cycle in fusion reaction as a source of Stellar energy. [6]
- (b) Distinguish between polarized and unpolarized light. Describe the process of production and detection of circularly polarized light. [6]
- (c) The magnetic flux within a stable orbit of Betatron changes from 1.384×10^3 wb to 8.44×10^2 wb in half of a minute. What would be the energy of an electron which undergoes 2×10^6 revolutions ? [4]