[2038]

B.E. I-Year Back Exam. April-2008

PHYSICS

EB704T

Time : 3 Hours **Maximum Marks : 60**

Instructions to Candidates:

Attempt overall 5 questions. Selecting one question from each unit. All questions carry equal marks.

1. a) What are Newton's rings? For Newton's rings in reflected monochromatic light prove that

i) Diameter of dark rings are proportional to the square root of natural numbers.

ii) Diameter of bright rings are proportional to the square root of odd natural numbers. **(6)**

b) Calculate the distance between two successive positions of a movable mirror of a Michelson's Interferometer giving distinct fringer in case of a sodium light having lines of wavelengths 5890 A^0 and 5896 A^0. **(6)**

OR

1. a) Explain the working of a biquartz polarimeter. How would you use it to find the specific rotation of optically active substance? **(4)**

b) A 5% solution of canesugar placed in a tube of length 40 cm, causes the optical rotation of 20^0. How much length of 10% solution of the same substance will cause 35^0 rotation ? **(4)**

c) Intensity of light through a polarizer and analyser is maximum when their principal planes are parallel. Through what angle the analysing Nical must be rotated so that the intensity gets reduced to $\frac{1}{4}$ of the maximum value. **(4)**

2. a) Derive an expression for the intensity distribution due to a single slit and show that intensity of first subsidiary maxima is about 4.5 per cent of that of the principal maxima. **(6)**

b) A grating is made of 200 wires per cm. Placed at equal distances apart. The diameter of each wire is 0.025 mm. Calculate the angle of diffraction of the third order spectrum and also find the absent spectra, it any. The wavelength of light used is 6000 A^0. **(6)**

OR

2. a) What is meant by resolving power of a plane transmission grating ? Derive an expression for it. Show that the resolving power is proportional to the width of grating. **(6)**

b) Monochromatic light of wavelength 6.56×10^{-7} m falls normally on a grating 2 cm. wide. The first order spectrum is produced at an angle of $18^0 15'$ from the normal. Deduce the total number of lines on the grating. **(6)**

3. a) Define spatial and temporal coherence with their examples. **(6)**

b) Define spontaneous and stimulated emissions. Describe the working of a Ruby Laser. **(6)**

OR

3. a) What is Holography? Describe the construction of a hologram and reconstruction of an image by hologram. **(8)**

b) Determine the numerical aperture of a index fibre when the core refractive index is 1.5 and the cladding refractive index is 1.48. Find the maximum angle for entrance of light if the fibre is placed in air. **(4)**

4. a) Describe Michelson-Moreley experiment and explain its out come. **(6)**

b) Calculate the percentage contraction of a rod moving with a velocity of 0.8C in a direction inclined at 60^0 to its own length. **(6)**

OR

4. a) Explain the construction, working and application of a scintillation counter. **(6)**

b) Derive Einstein's mass energy relation and explain it giving suitable examples. **(6)**

5. a) What is compton effect? Obtain an expression for compton shift. Give its experimental verification. **(6)**

b) The speed of an electron is measured to be 5.00×10^{3}m/s to an accuracy of 0.003%. Find the uncertainty in the determination of the position of this electron.

(Mass of electron = 9.11×10^{-31}kg. Planck's constant = 6.6×10^{-34}J-S. **(6)**

OR

5. a) What is potential barrier ? Calculate the transmission probability for rectangular potential barrier of small width for $E < V_o$. **(6)**

b) There are 2.54×10^{22} free electrons per cm^3 in sodium. Calculate its Fermi energy, Fermi velocity and Fermi temperature.

($h=6.6\times10^{-34}$J-S, $m=9.11\times10^{-31}$kg, $k=1.38\times10^{-23}$J/K, $1ev = 1.6\times10^{-19}$ Joule)**(6)**