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B—147—2019

FACULTY OF SCIENCE

B.Sc. (Fourth Semester) EXAMINATION

MARCH/APRIL, 2019

PHYSICS

Paper VIII (PHY-221)

(Optics and Laser)

(MCQ & Theory)

(Wednesday, 3-4-2019) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use separate OMR sheet to answer Q. No. **1**.

(*iv*) Negative marking system is applicable to MCQs.

(*ii*) *All* symbols carry usual meaning.

MCQ

1. Multiple Choice Questions : 10

(*i*) Equivalent focal length F of two coaxial lenses having focal length F_1 and F_2 separated by a distance d is :

(*a*) $\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2} + \frac{d}{F_1F_2}$ (*b*) $\frac{1}{F} = \frac{1}{F_1} - \frac{1}{F_2} - \frac{d}{F_1F_2}$

(*c*) $\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2} - \frac{d}{F_1F_2}$ (*d*) $\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2} - \frac{d}{(F_1 + F_2)}$

P.T.O.

(*ii*) In a coaxial lense system of two lenses, distance between 1st lense and the 1st principal point is given by :

(*a*) $\alpha = \frac{dF_2}{F}$ (*b*) $\alpha = \frac{dF}{F_2}$

(*c*) $\alpha = \frac{dF_1}{F}$ (*d*) $\alpha = \frac{dF}{F_1}$

(*iii*) In case of Newton rings due to reflected light, centre is :

(*a*) Bright (*b*) Dark

(*c*) Coloured (*d*) None of these

(*iv*) Wavelength difference between two neighbouring spectral lines due to Michelson's interferometer is given by :

(*a*) $\Delta\lambda = \frac{\lambda^2}{2d}$ (*b*) $\Delta\lambda = \frac{\lambda}{2d}$

(*c*) $\Delta\lambda = \frac{\lambda^2}{d}$ (*d*) $\Delta\lambda = \frac{2\lambda}{d}$

(*v*) In Fraunhoffer's class of diffraction distance between the obstacle and the source is :

(*a*) Finite (*b*) Infinite

(*c*) 100 cm (*d*) None of these

(*vi*) In Fraunhoffer's diffraction due to single slit, width of the central maxima is given by :

(*a*) $2x = \frac{2F\lambda}{a}$ (*b*) $x = \frac{2F\lambda}{a}$

(*c*) $2x = \frac{a}{2F\lambda}$ (*d*) $x = \frac{a}{2F\lambda}$

(*vii*) Refractive index of Canada Balsam used in the construction of Nicol prism is :

(*a*) $\mu = 1.658$ (*b*) $\mu = 1.55$

(*c*) $\mu = 1.45$ (*d*) None of these

(*viii*) Optically active substances which rotate the plane of vibration to the right are called as :

(*a*) Dextro-rotatory (*b*) Right handed

(*c*) Both (*a*) and (*b*) (*d*) None of these

(*ix*) Rate of absorption depends upon :

(*a*) Radiation density of photon

(*b*) Population of the energy state

(*c*) Both (*a*) and (*b*)

(*d*) None of the above

(*x*) Phenomenon of forced photon emission due to the action of an external agency is :

(*a*) Spontaneous emission (*b*) Stimulated emission

(*c*) Induced absorption (*d*) None of these

Theory

2. Solve any *five* : 10

(*a*) Draw a well labelled ray diagram of Huygen's eyepiece.

(*b*) Draw a well labelled ray diagram to obtain Newton rings.

(*c*) Draw a well labelled diagram of Michelson's interferometer.

(*d*) Define half wave plate and give the expression for its thickness.

(*e*) What is double refraction ?

(*f*) Draw the intensity distribution pattern due to slit diffraction.

(*g*) Give any *two* characteristics of spontaneous emission.

P.T.O.

3. (*a*) State and explain Rayleigh's criterion of resolution. 10

(*b*) Explain polarization by reflection.

Or

(*x*) Explain properties of laser beam.

(*y*) With neat labelled diagram explain the cardinal points of Huygen's eyepiece.

4. Explain the determination of wavelength of a spectral line using plane transmission grating. 10

Or

Derive the expression for the radius of *n*th dark Newton ring due to reflected light and hence show that fringe width decreases as the order of the ring increases.