STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2011-12)

SUBJECT CODE : 11PH/MC/OS44

B.Sc. DEGREE EXAMINATION APRIL 2013
BRANCH III - PHYSICS
FOURTH SEMESTER

REG. No._____

COURSE : MAJOR – CORE
PAPER : OPTICS AND SPECTROSCOPY
TIME : 30 MINS. **MAX. MARKS : 30**

TO BE ANSWERED IN THE QUESTION PAPER ITSELF

SECTION – A

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I CHOOSE THE CORRECT ANSWER:

1. The power of a thick lens is given by
   a) $P=P_1+ P_2+ P_1 P_2 t/ \mu$ b) $P=P_1+ P_2 - P_1 P_2 t/ \mu$
   c) $P=P_1- P_2 + P_1 P_2 t/ \mu$ d) $P=P_1+ P_2 - P_1 P_2 \mu / t$

2. The radius of the circle of least confusion measures the
   a) Coma b) astigmatism
   c) Longitudinal aberration d) lateral aberration

3. Ramsden's eyepiece consist of two plano -convex lenses of focal length 'f' separated by a distance equal to
   a)2f/3 b)3f/2 c)5f/2 d)2f/5

4. Fresnel used a biprism to show-----phenomenon
   a) Interference b) diffraction
   c) Polarization d) total internal reflection

5. A film of thickness in the range ____to _____ maybe considered as a thin film
   a) 0.5mm to 10mm b)0.5µm to 10µm c)0.05mm to 5 mm d)0.5nm to 10nm

6. In a thin film the condition for darkness is
   a)$2t \cos r=m/\lambda$ b)$2\mu t\cos r= m/\lambda$ c) $2\mu t\cos r= m\lambda$ d)$2t\cos r=m\mu\lambda$

7. The 200mm long tube containing $48cm^3$ of sugar solution produces an optical rotation of 11^0 when placed in a saccharimeter if the specific rotation of solution is
   a) 0.0833 g/cm^3 b) 833 g/cm^3 c) 0.833 g/cm^3 d) 8.33 g/cm^3

..2..

8. In zone plate waves reaching the image point through any two alternate zones differ in path by ___ and in phase by ___
a) λ ,2π b) λ/2 ,2π c) λ ,π d) λ/4 ,π/4

9. To obtain a Fraunhofer diffraction pattern the incident wave front must be ____ and the diffracted light is collected on the screen with help of a ____
a) plane, mirror b) spherical, mirror c) Plane, lens d) spherical, lens

10. The refractive indices of calcite for the o- ray and e-ray is
a) 1.486 and 1.66 b) 1.986 and 1.19
c) 1.66 and 1.486 d) 0.1486 and 0.166

11. A quarter wave plate introduces between e-ray and o-ray a phase difference given by
a) δ=π/2 b) δ=π c) δ=2π d) δ=3π/4

12. In the Fressnel's bi prism method two coherent sources are
a)two virtual images of sources b)one real and one virtual
c) Two separate real sources d) two prisms

13. In cooking ovens the waves used is
a)radio waves b)infrared waves c) Micro waves d) none

14. The range of visible light is
a)400nm-700nm b)4000nm-5000nm c) 40nm-70nm d) 400μm-700 μm

15. Among the following which one is called the electronic spectroscopy?
a) Infrared spectroscopy b) UV spectroscopy
c) Raman spectroscopy d) none of the above

II .Fill in the blanks

16. In Michelson interferometer a beam of light from an extended source is divided into two parts of equal intensities by partial ____ and ____.

17. It is obvious that the paths are straight lines when light rays travel in a ____ medium

18. A polarimeter is an instrument used for determining the _____.

19. The polarisation by double refraction was discovered by _____.

20. The speed of light is ____.

III. True or false

21. Fermat suggested that the principle of shortest path be replaced with the principle of least time.

22. In Newton's ring, the radius of m^{th} dark ring is inversely proportional to square root of wavelength

23. A zone plate has different foci for different wavelengths

24. The two rays are produced in double refraction one of the rays obeys Snell's law of refraction and hence is known as extraordinary ray

25. Energy of the infrared rays is more than that of UV rays

IV. Answer briefly

26. What is called aberrations?

27. Define diffraction.

28. Explain optic axis.

29. Explain stroke's lines.

30. Why the central image of Newton's ring is dark?

****

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2011-12)

SUBJECT CODE : 11PH/MC/OS44

B.Sc. DEGREE EXAMINATION APRIL 2013
BRANCH III - PHYSICS
FOURTH SEMESTER

COURSE : MAJOR – CORE
PAPER : OPTICS AND SPECTROSCOPY
TIME : 2 ½ HOURS **MAX. MARKS : 70**

SECTION – B

Answer any FIVE of the following: **(5 x 5 = 25)**

1. Find the focal length of a Plano-convex lens of refractive index 1.5, the radius of curvature of the curved surface being 20 cm and thickness 1cm.

2. In a bi prism experiment the eyepiece is placed at a distance of 1.2m from the source. The distance between virtual sources was found to be 7.5×10^{-4} m. find the wavelength of light if the eyepiece is to be moved transversely through distance of 1 .888cm for 20 fringes.

3. Explain the difference between Fraunhoffer and Fresnel diffraction

4. Plane polarized light passes through a calcite plate with its optic axes parallel to the faces. Calculate the least thickness of the plate for which the emergent beam will be plane polarized .(Given-μ_0=1.6584,μ_e=1.4864 and λ=5000 ^{0}A).

5. Light is incident normally on a grating 0.005m wide with 2500 lines. Find the angle of diffraction for the first order maximum of sodium line of wavelength. λ=5890 ^{0}A.

6. Find the radius of curvature of the lens surface in contact with the glass plate which produces Newton's rings with a light of wavelength 5890 ^{0}A, the diameter of the third dark ring is 3.2mm.

7. Explain the applications of IR spectroscopy.

SECTION – C

Answer any THREE of the following: (3x15 =45)

8. What are the functions of a field lens used in an eyepiece? Give the construction of a Huygens eyepiece and calculate the positions of the cardinal points.

9. Explain with necessary theory, the Newton's rings method of measuring the wavelength of light.

10. Give the theory of diffraction grating. Describe in detail how you would use a transmission grating for measuring the wavelength of light.

11. i) Explain the terms a) double refraction b) positive and negative crystals.

    ii) What is a quarter wave plate? How is circularly polarized light produced in the laboratory with the help of a quarter wave plate?

12. Explain the construction and working principle of Raman spectrophotometer. Discuss the applications of Raman spectroscopy.

****