STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2015-16)

SUBJECT CODE : 15PH/MC/OS34

B.Sc. DEGREE EXAMINATION NOVEMBER 2016
BRANCH III - PHYSICS
THIRD SEMESTER

REG. No._____

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

SECTION – A
TO BE ANSWERED IN THE QUESTION PAPER ITSELF

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I CHOOSE THE CORRECT ANSWERS:

1. The power of convex lens is
   a) negative b) positive c) zero d) one

2. This explains why light propagates along straight lines
   a) Fermat's principle b) snell's law c) Brewster's law d) none

3. The aberrations produced by the variation of refractive index with wavelength of light are called
   a) Spherical aberration b) coma c) achromatism d) chromatic aberrations

4. The condition for bright fringes is path difference should be equal to
   a) $(2n+1)\lambda/2$ b) $n\lambda$ c) $2n-1\lambda$ d) $(n+2)\lambda$

5. The radii of the dark rings are proportional to
   a) Square root of the odd natural numbers b) Square of the odd natural numbers
   c) Square root of the natural numbers d) none

6. In Michelson's interferometer the two interfering beams are formed by
   a) Division of wavefront b) division of amplitude c) reflection d) none

7. The area of each half period zone is
   a) $nb\lambda$ b) $lb\lambda$ c) $\pi b\lambda$ d) $\Upsilon nq\lambda$

8. The adaptation to see the close objects as separate ones is called
   a) perception b) resolution c) dispersion d) cohesion

9. Diffraction is observed when the size of the obstacle is comparable to the
   a) wavelength of the light source b) frequency c) amplitude d) velocity

10. The phenomenon confirms that the light wave are transverse waves.
    a) reflection b) refraction c) diffraction d) polarization

11. The rays that obey snell's law are
    a) extra ordinary rays b) longitudinal rays c) ordinary rays d) sound waves

12. The half wave plate rotates the plane of polarisation of the incident light through
    a) 3θ b) θ c) 2θ d) 4θ

..2

13. Incandescent solids like iron emit this kind of spectra
    a) line spectra b) continuous c) brand spectra d) none

14. Solar spectrum was first observed by
    a) Newton b) Rayleigh c) Huygen d) Einstein

15. Fluorescence is exhibited by
    a) calcium sulphide b) barum sulphide c) calcite d) quinine sulphate

II FILL IN THE BLANKS:

16. The unit of power of a lens is _____.
17. The wavelength of light wave _____ in a medium.
18. The reciprocal of dϴ measures the resolving power of _____.
19. The line bisecting any two blunt corners is _____.
20. Carbon compounds emit _____ spectra.

III STATE WHETHER TRUE OR FALSE:

21. Refractive index decreases as the wavelength increases.
22. A biprism creates two real coherent sources.
23. The numerical aperture of electron microscope is greater than the ordinary microscope.
24. The most common uniaxial crystal is calcite.
25. The spectrographs used for studying infrared spectra employ mirrors.

IV ANSWER BRIEFLY:

26. What is coma?

27. State principle of superposition:

28. What is a zone plate?

29. Define double refraction.

30. Mention any two applications of infrared spectroscopy:

××××××

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2015-16)

SUBJECT CODE : 15PH/MC/OS34

B.Sc. DEGREE EXAMINATION NOVEMBER 2016
BRANCH III - PHYSICS
THIRD SEMESTER

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

SECTION – B

ANSWER ANY FIVE QUESTIONS: (5 x 5 = 25)

1. A convex lens of thickness 6 cm has radii of curvature 8 cm and 10 cm. Find the focal length and position of focal points and the principal points.

2. Calculate the separation between the coherent sources formed by a biprism whose inclined faces make angles of 2° with its base, the slit being 10 cm away from the biprism(μ=1.50).

3. A single slit of width 0.14 mm is illuminated normally by monochromatic light and diffraction bands are observed on a screen 2 m away. If the centre of the second dark band is 1.6 cm from the middle of the central bright band, deduce the wavelength of the light used.

4. Find the thickness of a quarter wave plate when the wavelength of light is 5890Å and μ_E=1.553 and μ_O=1.544.

5. Explain how a plane and circularly polarized light can be produced and analyzed using Nicol prism and Quarter Wave Plate.

6. Give the theory of Newton's rings. How is the wavelength of sodium light determined by Newton's rings method?

7. With a neat diagram explain spectrophotometer.

SECTION – C

ANSWER ANY THREE QUESTIONS: (3 x 15 = 45)

8. Explain with the help of a neat diagram, the construction and working of a Huygens's eyepiece. Why is it referred to as a theoretically perfect but a negative eyepiece?

9. Describe Michelson's interferometer with a neat diagram. How is the wavelength of light determined by using Michelson's interferometer?

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

..2

11. Define specific rotator power. Describe the construction and working of Laurent's half shade polarimeter. Explain briefly how is it used to determine the specific rotation of sugar solution.

12. Explain the quantum theory of Raman effect briefly. Discuss the origin of stokes and anti-stokes lines. Explain how Raman effect is used in the study of molecular structure.

××××××××