STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.

(For candidates admitted during the academic year 2004-05 & thereafter)

B.Sc. DEGREE EXAMINATION APRIL 2008
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 number of cardinal points in a lens is
        a) 8   b) 6   c) 4

2.   An air bubble inside water behaves as a
        a) convex lens   b) concave lens   c) plano convex lens

3.   Huygens's eyepiece is useful where we want to eliminate
        a) spherical & Chromatic aberration
        b) coma
        c) distortion

4.   A soap bubble appears multicolored in white light due to
        a) Interference   b) diffraction   c) polarization

5.   The fringe width in a young's double slit experiment can be increased by decreasing
        a) width of the slit
        b) wavelength of light
        c) separation between two slits

6.   The refracting angle of Fresnel's biprism is
        a) $179°$ b) $90°$ c) $1°$

7.   A zone plate behaves like a
        a) convex lens   b) concave lens   c) convex mirror

8.   The change in the angle of diffraction corresponding to a unit change in wavelength is called
        a) resolving power   b) dispersive power c) limit of resolution

9. The smallest angle that can be resolved by a normal human eye is
   a) 2 min   b) 2 sec   c) 0.2 min

10. Polarised glass is used in Sun glasses because
    a) it reduces the light intensity to half on account of polarization
    b) it is fashionable
    c) it is cheaper

11. Which one of the following ray cannot be polarized?
    a) X-rays   b) sound waves   c) radio waves

12. The face angle of a Nicol prism is
    a) 62 & 118°   b) 60 & 120°   c) 72 & 108°

13. Prof C.V. Raman was awarded Nobel prize for
    a) Raman effect
    b) the discovery of Radio
    c) the discovery of atomic structure

14. Light from a wax candle produces
    a) continuous spectrum   b) line spectrum   c) band spectrum

15. The Ultraviolet part of the spectrum consists of wavelength ranging from
    a) 4000-1000 Å   b) 8000-400 Å   c) 6000-4000 Å

II   STATE WHETHER TRUE OR FALSE:

16. Concave lens are used to correct the defect of astigmatism.

17. A phase difference of Π between two waves reaching between a point is equal to a path difference of $\lambda/4$.

18. Intensity of all bright diffraction fringes is not same.

19. Plane of polarization and plane of vibration are perpendicular to each other.

20. In Raman effect, the frequency difference between the modified and the excited light is independent of the incident light.

III FILL IN THE BLANKS:

21. The minimum distance between the real object and real image of a concave lens is _____.

22. When white light is used in Newton's rings experiment, then all fringes are _____.

23.   The angle of diffraction in a grating is independent of _____.

24.   The polarizing angle for glass is 57.5°. The refractive index is _____.

25.   The dark lines found in the solar spectrum is _____.

IV   ANSWER BRIEFLY:

26.   State snell's law.

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

28.   Define diffraction.

29.   Define double refraction.

30.   Why does the color of the sky appear blue?

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SUBJECT CODE : **PH/MC/OS44**

B.Sc. DEGREE EXAMINATION APRIL 2008
BRANCH III - PHYSICS
FOURTH 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 thin converging lens and a thin diverging lens are placed coaxially in air at a distance of 5cm. If the focal length of each lens is 10 cm. Find for the combination
   a) the focal length b) the power and c) position of the principal points.

2. The object glass of a telescope is an achromat of focal length 90cm. If the magnitude of the dispersive powers of two lenses are 0.024 and 0.036, Calculate their focal lengths.

3. The inclined faces of a glass prism $(\mu = 1.5)$ make an angle of 1° with the base of the prism. The slit is 10cm from the biprism and is illuminated by light of $\lambda = 5900\,\text{Å}$. Find the fringe width observed at a distance of 1m from the biprism.

4. The diameter of the central zone of a zone plate is 2.3mm. If a point source of light ($\lambda = 5900$ Å) is placed at a distance of 6m from it, calculate the position of the first image.

5. The wavelengths of sodium D lines are 589.593 μ m and 588.996 μ m. What is the minimum number of lines that a grating must have in order to resolve these lines in the first order spectrum.

6. Quartz has refractive indices 1.553 and 1.544. Calculate the thickness of the quarter wave plate for sodium light of wavelength 5890Å.

7. The wavelength of an infra-red radiation from an electric lamp is 400nm. Calculate its temperature.

SECTION – C

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

8. a) Explain the construction and working of a Ramsden's eyepiece. Find its cardinal points.
   b) Compare it with Huygen's eyepiece.   ..2

9.   a) Describe Michelson interferometer? How will you find the wavelength of monochromatic light with its help?
      b) How will you measure the difference in wavelength between the D lines of sodium light.

10.   a) Explain the difference between Fresnal and Fraunhofer classes of diffraction.
      b) Give the complete theory of Fraunhofer diffraction at a single slit?

11.   a) What is optical activity?
      b) Define specific rotation. Describe the working of a half shade polarimeter. How will you use it to find the specific rotation of sugar?

12.   a) Explain the concept of resonance.
      b) Discuss in detail the Nuclear magnetic resonance and give any one of the application.

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