**H-1476**

Reg. No. : .............................

Name : ...................................

# Third Semester B.Sc Degree Examination, October 2019

## First Degree Programme under CBCSS

## Complementary Course for Mathematics

## PY -1331.1 - OPTICS, MAGNETISM AND ELECTRICITY

## (2013 - 2017 Admissions)

Time : 3 Hours                                                                 Max. Marks : 80

### PART – A

Answer **all** the questions. Answer should not exceed **two** sentences.

**Each** question carries **1** mark.

1.  What is a metastable state?

2.  What is meant by dispersive power of a grating?

3.  What is meant by interferences?

4.  State Brewster's law

5.  Write down the condition for destructive interference

6.  Define resolving power of optical instruments

7.  Define spatial coherence

8.  What is the condition for stimulated emission in laser?

9. What are the different types of wave front?

10. What does acceptance angle mean?

## PART – B

Answer any **eight** question. Answer should not exceed **one** small paragraph.

**Each** question carries **2** marks.

11. Why population inversion is in necessary for Laser action to occur?

12. Explain why a series LCR circuit is called an acceptor circuit

13. Why the fringes are circular in Newton's ring experiment?

14. Give any four differences between a convex lens and zone plate.

15. Explain the dispersive power of a grating

16. How is polarized light **produced** by reflection?

17. Give any four **properties** of diamagnetic substance

18. What produces the colours you see on the surface of a soap dubble?

19. What is acceptor and rejecter circuit?

20. Explain clearly he basic difference between paramagnetism and ferromagnetism.

21. Explain the terms inversion of population and stimulated emission as applied to lasers

22. How will you determine the wavelength of a light using grating?

(8 × 2 = 16 Marks)

**H – 1476**

## PART - C

Answer any **six** questions. **Each** question carries **4** marks.

23. A laser beam of wavelength 740 nm hascoherrence time $4 \times 10^{-1}$ s. deduce the order of magnitude of its (a) coherence length, (b) spectral half-width and (c) the purity factor.

24. What will be the critical angle for a ray in a step-index fibre for which $n. = 1.53$ and which has a cladding whose R1 is 2.5 per cent less. .

25. The refractive index of the core in a step-index fibre is 1.50 and the relative refractive index difference between the core and the cladding of the fibre is 1.8%. estimate (a) the numerical aperture (NA), (b) the criticl angle at the core – cladding interface within the fibre.

26. The magnetic susceptibility of silicon is $-0.4 \times 10^{-5}$. Calculate the flux density and magnetic moment per unit volume when magnetic field of intensity $5 \times 10^5$ A/m is applied.

27. A magnetic material has a magnetization of 3300 A/m and flux density of 0.0044 $Wb/m^2$. Calculate the magnetic field and the relative permeability of the material.

28. Estimate the diamagnetic susceptibility of argon. Argon has atomic number 18 and at temperature 4K, its concentration is $2.66 \times 10^{25}$ $m^3$. Take root mean square distance of an electron from nearest nucleus to be $0.66 \overset{c}{A}$. Also calculate the magnetization of solid argon at 2T.

29. Consider a series LCR circuit with L=5.0 H, C-80µF, R = 40 $\Omega$ are connected to variable frequency 240V source. Calculate (a) the angular frequency of the source which drives the circuit at resonance., (b) the current at the resonating frequency, (c) the rms potential drop across the capacitor at resonance.

30. A series LCR circuit consists of a resistance of 10 $\Omega$, a capacitor of resistance 60 $\Omega$ and an inductor coil. The Circuit is found to resonate when put across 300V, 100 Hz supply. Calculate (a) The inductance of the coil (b) Current in the circuit at resonance.

**H –1476**

31. Calculate the ratio of the diameters of the fifth interference rings with and without water (refractive index 1.33) between the lens and the plate if the radius of curvature of lens is 0.50 m.

**(6 × 4 = 24 Marks)**

## PART - D

Answer any **two** questions. **Each** question carries **15** marks.

32. Describe an experiment to determine the refractive index of liquid by Newton's rings method.

33. (a) Explain the terms stimulated and spontaneous emissions.

    (b) Mention some important applications of laser?

    (c) How laser light is propagated through optical fiber?

34. Give an account of weiss theory of ferromagnetism. On the basis of this theory, how will you explain hysteresis and curie point? Explain clearly the basic difference between paramagnetic and ferromagnetic substances.

35. (a) What do you mean by diffraction of light and state the condition for the diffraction?

    (b) Describe the phenomenon of Fresnel diffraction at straight edge.

**(2 × 15 = 30 Marks)**

_____

H – 1476