Reg. No. : ....

Name : ....

Third Semester B.Sc. Degree Examination, March 2021

First Degree Programme under CBCSS

Physics

Complementary Course for Mathematics

PY 1331.1 : OPTICS, MAGNETISM AND ELECTRICITY

(2019 Admission Regular)

Time : 3 Hours

Max. Marks : 80

PART – A

Answer **all** the questions. Answer should not exceed **2** sentences. Each question carries **1** mark.

1. What is interference?

2. Explain the phenomenon behind diffraction.

3. How is Newton's ring formed?

4. What is the principle behind the working of a LASER?

5. What is an optical pumping? give example

6. Name four elements which exhibit paramagnetism.

7. Define the term magnetic permeability.

8. What do you mean by resonant frequency?

9. What is the practical application of a series LCR circuit?

10. What do you mean by power factor?

<div align="right">**(10 × 1 = 10 Marks)**</div>

PART – B

Answer **any eight** questions. Answer should not exceed one small paragraph. Each question carries **2** marks.

11. Write note on the comparison of prism spectra and grating spectra.

12. What is Fraunhoffer diffraction?

13. State the principle of superposition of waves.

14. What do you understand by

    (a) fringes of equal thickness

    (b) fringes of equal inclination?

15. Explain briefly about spontaneous emission.

16. Write a short note on magnetic susceptibility.

17. Compare the magnetic properties of diamagnetic, paramagnetic and ferromagnetic materials.

18. Write note on population inversion.

19. Write note on ferromagnetism.

20. Briefly explain about choke coil and its applications.

21. Write note on stimulated emission.

22. Explain about the resolving power of a plane diffraction grating.

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23. What do you mean by the dispersive power of a grating? On what factors do it depends.

24. What do you mean by fringe width of interference? On what factors do it depends on?

25. With a neat diagram explain about the series RC circuit.

26. Mention the uses of transformers.

<div align="right">(8 × 2 = 16 Marks)</div>

PART – C

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

27. In a Newton's rings experiment with air film the diameter of the mth dark ring is 0.577 cm. With a liquid film the same arrangement gives similar rings but the diameter of the mth ring becomes 0.434 cm. Find the refractive index of the liquid.

28. A parallel beam of light of wavelength 4500Å is incident at an angle of 30° on a plane transmission grating which has 9000 lines / cm. find the highest order spectrum that can be observed.

29. Light of wavelength 6000Å is incident on a narrow slit of width 0.30mm. The screen is placed 2m away from the slit. Find (a) the position of the first dark fringe and (b) the width of the central bright fringe.

30. Two coherent are 0.15mm apart and the fringes are observed on a screen 50cm away. It is found that with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of 10.5 mm from the central fringe. Calculate the wavelength of light.

31. If the number of lines per millimetre of a grating is 589, how many orders of spectra are possible for light of wavelength 6.00×10^{-7} m?

32. A soft iron ring has a mean diameter of 0.2m and an area of cross section of 5×10^{-4} m^2. It is uniformly wound with a coil of 2000 turns and a current of 2A is passed through it. The magnetic flux produced in the iron ring is 8×10^{-3}Wb. Calculate the relative permeability of iron.

33. A step down transformer is connected to a mains supply of 220 volts is made to operate a 12 volt 40 watt bulb. Ignoring the energy losses, calculate (a) current in the primary coil (b) transformation ratio, assuming that there is no loss of power.

34. Find the natural frequency of a circuit containing an inductance of 50 μH and capacitor of capacity 0.001 μF.

35. An AC of 180 volts and 100Hz is fed to a circuit containing a resistance R and capacitance C connected in series. Calculate the values of R and C when the maximum current is 5 A and active power is 300 watts.

36. Find the numerical aperture and acceptance angle of a core index 1.5 and $\Delta = 0.05$.

37. A step-index fiber has a core index of refraction of $n_1 = 1.425$. The cut-off angle for light entering the fiber from air is found to be 8.50°. Calculate (a) numerical aperture (b) index of refraction of the cladding (c) If the fiber were submersed in water, what would be the new numerical aperture and cut-off angle? [given $n_{air} = 1.0003$]

38. In a series RLC, circuit R= 30 Ω, L = 15 mH, and C = 51 μF. If the source voltage and frequency are 12 V and 60 Hz, respectively, what is the current in the circuit?

(6 × 4 = 24 Marks)

PART – D

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

39. Describe briefly about the light propagation in optical fibre and mention its applications.

40. Explain the electron theory of magnetism and the explanation of ferromagnetism.

41. Explain with the neat diagram the series LCR circuit and its resonance.

42. Explain the theory of interference and conditions for maximum and minimum intensities with equations.

43. Explain the Fresnel's diffraction at straight edge and discuss the pattern.

44. Comment on the long distance power transmission, transformers and its uses.

(2 × 15 = 30 Marks)