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

(2013, 2015-2017 Admission)

Time : 3 Hours   Max. Marks : 80

SECTION – A

Very short answer type questions. (Answer **all ten** questions of **1** mark each).

1.   What is meant by coherent sources?

2.   What is the relation between intensity and amplitude of a wave?

3.   Write down the expression for the radius of the Zone plate.

4.   What if meant by constructive interference?

5.   What are the conditions for total internal reflection?

6.   Define numerical aperture.

7.   What is the relationship between magnetic vectors B, H and M?

8.   Define magnetic susceptibility.

9. Write down the expression for rms value of alternating current.

10. What is meant by iron loss in a transformer?

SECTION – B

Short answer type questions (Answer **any eight** questions of **2** marks each).

11. What are the conditions for a sustained interference of light waves?

12. Write a note on fringes of equal thickness and equal inclination.

13. Compare Zone plate with a convex lens.

14. What is meant by resolving power of a plane transmission grating?

15. What do you mean by the directionality of Laser beams?

16. What are the advantages of optical fiber over copper cable?

17. Define magnetic susceptibility and magnetic permeability.

18. Explain the properties of ferromagnetic materials.

19. Derive an expression for the emf induced in a coil rotating in a uniform magnetic field.

20. What is the principle of choke coil?

21. Distinguish between the spectra obtained with a grating and a prism.

22. What is wattles current?

(8 × 2 = 16 Marks)

SECTION – C

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

23. Green light of wavelength $5000\,A°$ from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen 200 cm away is 2cm. find the slit separation.

24. Light of wavelength 500 nm is incident on a plane transmission grating. A second order spectral line is observed at an angle of 30°. Calculate the number of lines per meter on the grating surface.

25. A step index fiber has a core of refractive index 1.5 and refractive index of cladding is 1.49. Find the value of numerical aperture.

26. Find the magnetic induction at the centre of a square current loop of side 1 meter carrying a current of 1 ampere.

27. The current through an inductance of 100 mH is increased from 0 to 2A in 0.04s. Calculate the induced emf in the inductance.

28. A source of emf 50 V. r.m.s is connected across an air cored coil. When the supply is 50 Hz the power consumed is found to be 100 W. where as when the frequency is increased to 100 Hz, the power becomes 50 W. Find the self inductance and the resistance of the coil.

29. An electric which runs at 100 volts DC and 10 amp current is connected to 220 volts 50 Hz A.C mains. Calculate the inductance of the choke in the circuit.

30. If an AC main supply is given to be 220 V, what would be the average emf during a positive half cycle.

31. A parallel beam of sodium light ($\lambda = 589 \times 10^{-9}m$) is incident on a thin glass plate (n= 1.5) such that the angle of refraction into the plate is 600. Calculate the smallest thickness of the plate which will make it appear dark by reflection.

(6 × 4 = 24 Marks)

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SECTION – D

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

32. How can Newton's rings be used to determine the refractive index of a liquid?

33. With a neat sketch, explain the propagation of light wave in step index and graded index fiber. What are the applications of optical fiber?

34. Describe and explain the Fresnel's diffraction at a straight edge.

35. Find an expression for the power in A C circuit containing resistance, inductance and capacitance. Determine the condition that the current in the circuit may be wattles.

(2 × 15 = 30 Marks)