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K – 2416

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

(2018 Admission)

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 Fraunhofer diffraction?
2. What is meant by grating element?
3. What are coherent sources?
4. Why Newton's rings are circular?
5. Name the active medium in a ruby laser.
6. Name four elements which exhibit ferromagnetism?
7. Define the term magnetic susceptibility.

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8. What do you mean by numerical aperture?
9. What is a transformer?
10. What do you mean by wattless current?

(10 × 1 = 10 Marks)

PART – B

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

Each question carries **2** marks.

11. Distinguish between interference and diffraction.
12. Distinguish between dispersive power and resolving power of a grating.
13. Explain constructive interference with equations.
14. What are the applications of optical fibre?
15. What is an optical pumping? Give example.
16. Explain the magnetic properties of paramagnetic materials.
17. Write note on graded index fiber.
18. Write note on ferromagnetism.
19. Comment on the magnetic susceptibility and permeability of diamagnetic materials and give examples.
20. Briefly explain about principle of light propagation in an optical fiber.
21. Write note on the Propagation Modes of optical fiber.
22. Explain the terms angle of refraction and angle of incidence.

(8 × 2 = 16 Marks)

PART – C

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

23. A step index fibre has a numerical aperture of 0.20 and a cladding refractive index of 1.59. Find the acceptance angle for the fibre in water which has a refractive index of 1.33.
24. An optical fibre has an acceptance angle 34.72° . Calculate its numerical aperture. If the refractive indices of core and cladding are 1.53 and 1.42. Calculate its critical angle.
25. In Fraunhofer diffraction pattern due to a narrow slit a screen is placed 2m away from the lens to obtain the pattern. If the slit width is 0.5mm and the first minima lie 2mm on either sides of the central maximum, find the wavelength of light.
26. A parallel beam of light of wavelength 6000 \AA is incident at an angle of 30° on a plane transmission grating which has 5460 lines / cm. find the highest order spectrum that can be observed.
27. A specimen of radius 0.25cm is kept parallel to magnetising field 4000 Am^{-1} . It acquires a pole strength of 8Am. Calculate the magnetic susceptibility and permeability of the material.
28. A resistor of 3 ohms and a capacitor of capacity $800 \mu\text{F}$ are connected in series across 220 volts 50 cycles AC. Calculate
 - (a) capacitive reactance
 - (b) impedance
 - (c) current
 - (d) pd across the resistance
 - (e) pd across the capacitor
 - (f) the phase lag.

29. Find the value of the current through an inductance of 0.5H when connected to an AC source of 220V and 50cps is applied to it.
30. Diameter of a particular dark ring in Newton Rings experiment in reflected system is 0.8 mm . When a transparent liquid of refractive index 1.6 is placed between lens and the plate, calculate the diameter of ring.
31. A series RLC circuit consists of a $12\ \Omega$ resistor, a $100\ \mu\text{F}$ capacitor, and a 150 mH inductor. If the source frequency is 50 Hz , calculate the total impedance.

(6 × 4 = 24 Marks)

PART – D

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

32. Describe briefly about the light propagation in optical fibre and mention its applications.
33. With neat diagram explain about transformers, its different types and applications.
34. Give the theory of a plane transmission grating and describe how it is used to determine the wavelength of light, using grating at normal incidence with a neat diagram.
35. Discuss the interference in thin films-(reflected systems) and the effect of thickness of film.

(2 × 15 = 30 Marks)