

SECOND YEAR B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2009

Part III Physics—Subsidiary

Paper II—ELECTRODYNAMICS, OPTICS, ELECTRONICS AND NUCLEAR PHYSICS

(2001 admission onwards)

Time : Three Hours

Maximum : 55 Marks

Part A

*Answer and **two** questions.
Each question carries 8 marks.*

1. (a) Show that the capacity of a capacitor increases when a dielectric is introduced between the plates of a capacitor. (4 marks)
- (b) Obtain Maxwells equations of Motion. (4 marks)
2. With necessary theory explain the production and detection of elliptically polarised light. (8 marks)
3. Derive Braggs Law. Explain how a Braggs spectrometer can be used to determine crystal spacing. (8 marks)
4. With the help of a neat diagram, explain the working of a Colpitts oscillator. ~~(8 marks)~~ [2 x 8 = 16 marks]

Part B

*Answer any **sixteen** questions.
Each question carries 1% marks.*

5. Explain polarisation of a dielectric.
6. Define atomic polarisability.
7. Give Maxwells modified form of Ampere's law:
8. State Brewster's law.
9. What is double refraction ?
10. Explain why very thin films appear black in reflected light.
11. What are Haidinger fringes ?
12. Distinguish between Fresnel and Fraunhofer diffraction.
13. Define dispersive power of a grating.
14. How is the photoelectric current related to the intensity of incident radiation ?

Turn over

15. Mention 3 uses of photoelectric cells.
16. How is the intensity and frequency of X-rays in a Coolidge tube controlled ?
17. What are characteristic X-rays ?
18. Give the principle of electron microscope.
19. Explain the physical significance of wave function.
20. State energy time uncertainty principle.
21. What are Eigen functions ?
22. Distinguish between spontaneous and induced emission.
23. Give *three* uses of lasers.
24. Draw the circuit diagram of a R.C. coupled amplifier.
25. What is a Zener diode ?
26. How is the magnetic moment related to spin of the nucleus?
27. Describe Yukawas meson theory of Nuclear forces.
28. Distinguish between fission and fusion.

(16 x = 24 marks)

Part C

*Answer any **five** questions.
Each question carries 3 marks.*

29. Derive generalised form of Gauss Law.
30. Deduce a relation between the magnetic field and the current that produces it which flows in a closed loop.
31. The specific rotation of quartz of thickness 1 mm. is $29^\circ/\text{mm}$. Calculate the difference in refractive indices ($T = 5890 \text{ \AA}$).
32. A plane transmission grating has 6,000 lines/ cm over a length of 10 cm. Find in the wavelength of 600 nm. in the second order (a) resolving power (b) smallest wavelength that can be resolved.
33. Calculate the work function of sodium in eV. Given threshold wavelength is 6800 \AA
 $h = 6.625 \times 10^{-34} \text{ JS}$.
34. Find the deBroglie wavelength associated with an electron moving with a velocity of 10^7 m. s^{-1} .
 $m = 9.1 \times 10^{-31} \text{ kg}$. $h = 6.63 \times 10^{-34} \text{ JS}$.
35. Show that $\frac{a}{1-a}$
36. The radius of H^+ is 7.731 fm. Deduce the radius of He^+ .

(5 x 3 = 15 marks)