

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034.  
B.Sc. DEGREE EXAMINATION – MATHEMATICS  
FOURTH SEMESTER – APRIL 2002  
**PHY 200 PHYSICS FOR MATHEMATICS**

19.04.2002  
9.00 – 12.00

Max : 100 Marks

**PART - A**

Answer ALL the questions.

(10x2=20 marks)

01. What is Fresnel Diffraction?
02. Find the thickness of a quarter wave plate, when the wavelength of light is  $5890 \text{ \AA}$ ,  $\mu_E = 1.553$  and  $\mu_o = 1.544$
03. State Biot-Savart's Law.
04. Define Self-inductance. Give its unit.
05. State Heisenberg's Uncertainty Principle.
06. Calculate the binding energy of a deuteron.  
[ Give  ${}_1^1\text{p} = 1.00813 \text{ amu}$ ,  ${}_0^1\text{n} = 1.00893 \text{ amu}$ ,  
 ${}_1^2\text{H} = 2.01473 \text{ amu}$ ]
07. State Pauli's exclusion principle.
08. State any two Postulates of wave mechanics.
09. Define CMRR and write its output equation.
10. What is Flip Flop? Where is it used?

**PART - B**

Answer any FOUR questions

(4x7.5=30 marks)

11. Define specific rotation and describe the experimental arrangement of Laurents half shade Polarimeter. How is it used to find the specific rotation of sugar?
12. a) Obtain an expression for the Loss of energy due to sharing of charges? (4)  
b) A capacitor of  $10 \mu\text{F}$  charged to 100V is connected in parallel to another capacitor of  $5 \mu\text{F}$  charged to 50V. Calculate the loss of energy after contact. (3.5)
13. a) Write a note on Spectral Series of hydrogen atom? (4.5)  
b) Wavelength of Balmer first line is  $6563 \text{ \AA}$ . Calculate the Wave length of Second line (3)
14. Obtain the values of the energy of a particle in a one dimensional box.
15. Describe the ideal OP-AMP conditions. Construct with neat diagrams and theory, circuits involving OP-AMP as an inverter, adder and Integrator.

**PART – C***Answer any FOUR questions*

(4×12.5=50 marks)

16. Discuss the theory of plane diffraction grating. Describe an experiment to determine the wave length of light using a plane transmission grating.
17. a) State Kirchoff's Laws. (3)  
 b) Explain the method of finding the specific resistance of the material of a wire using Carey Foster's bridge (9.5)
18. a) Give the theory of successive disintegration of radioactive substance. Explain what is radioactive equilibrium. (10.5)  
 b) Find the disintegration constant of radium, given that its half life period is 1620 years. (2)
19. a) Construct a 3-bit Asynchronous counter with truth table and draw its output Waveform (6.5)  
 b) A 4-variable input gives a high output for alternate input conditions from 0000=0, 0001=1,... etc .. Draw the truth table and simplify the above condition by constructing a Karnaugh map. Draw a simplified circuit.
20. a) With relevant theory, explain Davisson and Germer experiment for diffraction of electrons (10)  
 b) Calculate de-Broglie Wavelength of an electron accelerated through a potential of 150 volts. (2.5)

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