National Officers Academy

Mock Exams for CSS-2023

December 2022(Final)

PHYSICS, PAPER-II

TIME ALLOWED: THREE HOURS	**PART-I (MCQS) MAXIMUM MARKS = 20**
PART-I(MCQS): MAXIMUM 30 MINUTES	**PART-II MAXIMUM MARKS = 80**

NOTE:

i. **Part-II** is to be attempted on the separate **Answer Book**.
ii. Attempt **ONLY FOUR** questions from **PART-II**. **ALL** questions carry **EQUAL** marks.
iii. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
iv. Use of Calculator is allowed.

SUBJECTIVE PART — PART-II

Q2.

a. Derive time independent Schrodinger wave equation for an electron bound in an orbit around the nucleus.
b. Prove Heisenberg uncertainty principle on the basis of commutation relation.
c. How can we prove electron does not reside inside nucleus?

Q3.

a. What were the problems that classical mechanics could not explain photo electric effect successfully? Give Einstein analysis.
b. X-rays with ware length 100pm are scattered from a carbon target. The scattered radiation in viewed at 90^{o} to the incident beam. What is Compton's shift?
c. What are the experiments which reveal dual nature of light?

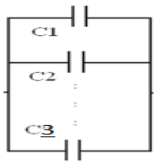
Q4.

a. Find electric field due to disc of charge with radius R.
b. Find electric potential due to an electric dipole.
c. Is it possible to shield a room against electric forces, magnetic forces and gravitational forces?

Q5.

a. Calculate capacitance of cylindrical & spherical capacitor.
b. Find the equivalent capacitance of below capacitors:

$c_1 = 5$ $c_2 = 10$ $c_3=15$



c. What is RC-time constant in charging of a capacitor?

Q6.

a. Prove that Radio-active decay follows decaying exponential law.
b. How does an accelerator work?
c. Find the nuclear radius of Iron's Nucleus.

Q7.

a. What is Doping? Explain forward & reverse characteristics.
b. Find the capacitive reactance of an A.C circuit with inductance of 230mH & frequency 60 Hz.
c. Distinguish BJT & MOSFET.

Q8. Write a note on any **TWO** of the following:

a. Poynting Theorem & Vector.
b. Maxwell's equations
c. Cyclotron.

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Best of Luck for CSS-2023