National Officers Academy

Final Mock Exams for CSS-2021

January 2021

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. All the parts (if any) of each Question must be attempted at one place instead of at different places.
iv. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
v. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
vi. Extra attempt of any question or any part of the question will not be considered.

SUBJECTIVE PART II

Q. No. 2.a) Apply Gauss's law to find electric field at an arbitrary point near a thin insulating sheet of infinite extent having uniform charge density δ.

b) What are the limitations of Columb's law?

c) Two-point charges -q & 1/2 q are situated at the origin & at the point (a, 0, 0) respectively. At what point along the x-ais does the electric field vanish?

Q. No. 3.a) Draw a circuit diagram for N-P-N transistor, In common emitter configuration explain how it works as voltage amplifier?

b) Differentiate conductors, insulators & semi-conductors on the basis of energy band theory.

c) Explain how a diode works as rectifier?

Q. No. 4. a) What is a nuclear reactor? How does it work?

b) Explain purpose of moderator & control rods in reactor.

c) The half-life of a radio isotope is 140 days. How many days would it take for the decay rate if a sample of this isotope to fall to one fourth of its initial value?

Q. No. 5. a) Discuss Bohr's postulates on hydrogen atom.

b) Derive Bohr's radius

c) An electron jumps from a level E_1=-3.5$X10^{-19}$. J to E_2= = -1.20$X10^{-18}$. What is wavelength of emitted light?

Q. No. 6. a) Find the wave function of a particle trapped in one dimensional box of length "L".

b) Differentiate Normal & anomalous Zeeman Effect.

c) An electron is placed in a box about the size of atom that is about $1X10^{-10}$. What is the velocity of electron?

Q. No. 7. a) Derive the relation for Compton's shift.

b) Distinguish photoelectric effect, Compton's effect & pair production shortly.

c) X-rays of wavelength 22pm are scattered from a carbon target. The scattered radiations being viewed at 85^o. What is Compton's shift?

Q. No. 8. Write a note on any TWO of the following:

a) Magnetic properties of material.

b) Maxwell's equation

c) Poynting vector & poynting theorem.

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Best of Luck for CSS-2021