National Officers Academy

Mock Exams for CSS-2022

January 2022 (MOCK-7)

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

Q. No. 2. (a) Drive an expression for the torque and potential energy of an electric dipole in an electric field.
(b) Show that energy stored in the electric filed is proportional to the square of electric field.
(c) What is the time constant for capacitor?

Q. No. 3. (a) Find the electric field of charge uniformly distributed on a line of charge.
(b) A plastic rod whose length is 220cm and radius is 3.6mm, carries a negative charge of magnitude 3.8×10^{-7}C. Find the electric field near mid-point of rod, at a point on its surface.
(c) Why Gauss's law is preferred than Coulomb's law?

Q. No. 4. (a) State any two postulates of Quantum mechanics.
(b) Derive an expression for the wave-function of 1-dimensional box, containing a quantum particle.
(c) Calculate the DE Broglie wavelength of a dust particle of mass 1×10^{-9}kg, drifting with a speed of 2m/s.

Q. No. 5. (a) Distinguish between conductors, insulators and semi-conductors on the basis of Energy Band Theory.
(b) How transistor acts as an amplifier?
(c) If collector current is 100 mA and base current is 120μA. What is the current gain factor?

Q. No. 6. Write a note on any TWO of the following:
(a) Maxwell's equations
(b) Poynting's Theorem and Poynting's Vector
(c) Magnetic properties of materials.

Q. No. 7. (a) What are the difficulties in operation of nuclear reactor?
(b) Prove radioactivity follows exponential decay law.
(c) Find the nuclear radius of copper.

Q. No. 8. (a) Discuss uncertainty principle on the basis of communication relation.
(b) How two protons of same charge can reside in a nucleus?
(c) Find uncertainty in location of a particle in terms of wavelength so that uncertainty in its velocity is equal to its velocity.

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Best of Luck for CSS-2022