National Officers Academy
Mock Exams for CSS-2023
December 2022(Final)
PHYSICS, PAPER-I

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.

PART-II

**Q2.**
a. What is mass variation in theory of relativity? Derive its expression. (10)
   b. What are conservative & non-conservative forces? Give one example of each. Prove that work done in a closed path is zero.
c. A force acting on a particle moving on X-Y plane is given by (05)
   $$F = (2y\,i + x^2\,j)N$$
   Where x & y are in meters. Particle moves from origin to final position having coordinates x = 5m & y = 5m. Shown in figure. Calculate the work done by the force "F" along:
   i.   Path OAC
   ii. Path OC
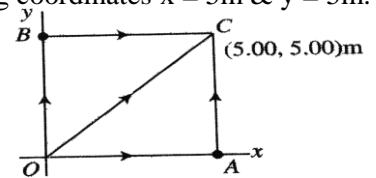
Q3.
a. A vector is given. $A = 3i + j + 5K$
   Find the magnitude of A & angle between Y and Z-axes.
b. Write 5-characteristics of cross product of two vectors. (10)
c. What is vector triple product? Give its physical significance. (05)

Q4.
a. Explain the difference between liner & angular momentum. Discuss law of conservation of angular momentum. (12)
b. What force is needed to accelerate: (05)
   i.   A 1000kg car at 1/2g
   ii. A 200g apple at same rate.
c. What is moment of inertia? Give its significance. (03)

Q5.
a. Explain Young's double slit experiment to the interference of light.
b. In a double slit the distance "D" of screen form the slits is 52cm, wavelength is 480nm, slot separation is d=0.12nm. Find the spacing between adjacent fringes.
c. Why dark fringe is formed at the center of Newton's Rings?

Q6.
a. Distinguish Laminar & Turbulent flow. Calculate the expression for Bernoulli's Theorem.
b. What is projectile motion? Derive the expressions for height & range of projectile.
c. A projectile is fired in such a way that horizontal range is equal to three times the maximum height. Find angle of projection.

Q7.
a. State and explain 3-laws of thermodynamics.
b. Find the work done in adiabatic and isochoric process.
c. Find the expression for the efficiency of Carnot engine.

Q8. Write note on any **TWO** of the following:
a. Bose Einstein Distribution.
b. i. Surface Tension
   ii. Equation of continuity
c. LASERs

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Best of Luck for CSS-2023