For Admission in M.Phil. High Energy Physics

Concepts of the following subjects can be included in the exam test:

- Mathematics (Quantitative skills, Vectors, Calculus, Complex Analysis, Fourier and Taylor Series)
- Quantum Mechanics
- Computational skills (understanding simple programs and algorithms)
- Electromagnetism (Law of electrostatics and magneto statics, and Maxwell's equations etc.)
- Classical Mechanics (including the Lagrangian and Hamiltonian formulations)
- Special Relativity
- Atomic and Nuclear Physics
- Statistical Physics
- Verbal reasoning (English)
- Analytical reasoning (Logical thinking)

The students may consult the following books:

1. "Calculus and Analytic Geometry" by G.B. Thomas and R.L. Finney,
2. "Mathematical Methods for Physicists", G. Arfken,
3. "Physics", by Halliday, Resnick and Krane,
4. "Perspectives of Modern Physics", by A. Beiser,
5. "Quantum Mechanics" by Zettili
6. "Mathematica for Scientists and Engineers" by Thomas B. Bahder
7. "Classical Electrodynamics" by Griffith or Ritz
8. "Classical Mechanics" by T.L. Chow,
9. "Statistical physics" by F. Reif
10. "Nuclear Physics" by Berchem or Williams
11. "GAT General" Dogar Publisheres
    or other books of the similar standard and contents.

Sample Paper for the Admission Test of M. Phil, 2022
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Encircle the correct one amongst the choices given against each question.

1. Eigenvectors of a Hermitian operator belonging to different eigenvalues are
   α) not possible
   β) scalar multiple of each other
   γ) complex conjugate of each other
   δ) orthogonal.

2. What is the speed of a cubical box so that its contracted volume is half of its value when at rest?
   α) 0.866c   β) 0.5c   γ) 0.999c   δ) 0.233c η) 0.144c

3. What is the standard deviation in decay rate of an unstable nucleus if its average rate is 64 s^{-1}?
   α) 4 s^{-1} s   β) 6 s^{-1} γ) 8 s^{-1} δ) 10 s^{-1} η) 6.4 s^{-1}

4. Consider a solenoid with R<<L. The magnetic field at the center of the solenoid is B_0. A second solenoid is constructed that has twice the radius, twice the length, and carries twice the current as the original solenoid, but has the same number of turns per meter. The magnetic field at the center of second solenoid is
   α) B_0/2   β) B_0 γ) $2B_0$ δ) $4 B_0$

5. Let $Z_0 = \frac{1}{2}i$ lies inside a simple closed path C. Then $\oint \frac{z^3 - 6}{2z - i}$ is equal to
   α) $\frac{\pi}{8} - 6\pi i$ β) $\frac{1}{8} - 6i$ γ) $\frac{1}{8} - 6\pi i$ δ) $\frac{\pi}{8} - 6i$

6. Let $A = \begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$, then eigensystem of the matrix A is
   α) $\begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ -2 \end{bmatrix}, 0, -1, 3$ β) $\begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \end{bmatrix}, 0, -1, -6$ γ) $\begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \end{bmatrix}, 0, 1, -6$ δ) $\begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ -2 \end{bmatrix}, -1, 3$

7. At the end of the following assignments: x = 2; y = 3; x = y + x; y = y − x; x = y^2, the values of x and y are
   α) 2, 3   β) 3, 2   γ) 4, -2   δ) 4, 3

8. Consider a rigid body moving freely in space, then which statement is true for the number of degree of freedom and for the number of constraint equations
   α) No. of Degree of freedom is 3 and No. of constraint equations is 3
   β) No. of Degree of freedom is 6 and No. of constraint equations is 2
   γ) No. of Degree of freedom is 6 and No. of constraint equations is 3
   δ) No. of Degree of freedom is 3 and No. of constraint equations is 6

9. The judge acquitted the prisoner_____ the charges of murder.
   α) About   β) From   γ) Of   δ) With η) By

10. Four computer operators (A, B, C, D) each have to perform duties in an office on four different days, Thursday through Sunday. The following is their duty schedule; C has his duty day before A. D has his duty day later than B. Which of the following is a possible order of duty days for the four operators?
    α) C, D, A, and B
    β) D, C, A, and B
    γ) B, C, D, and A
    δ) A, C D, and B
    η) A, B, D, and C