STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-600086.
(For candidates admitted during the academic year 2019-2020 & thereafter)

SUBJECT CODE : 19PH/PC/QM44

M.Sc. DEGREE EXAMINATION - APRIL 2023
BRANCH III - PHYSICS
FOURTH SEMESTER

COURSE : MAJOR – CORE
PAPER : QUANTUM MECHANICS II
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

ANSWER ALL THE QUESTIONS: **(10 x 3 = 30)**

1. Explain harmonic perturbation. Give example.
2. Brief on dipole approximation in perturbation theory.
3. What is metric tensor? Mention its use.
4. Brief about Minkowski force.
5. Mention the importance of Klein-Gordon equation.
6. What is Lamb shift?
7. What is exchange degeneracy?
8. What is time reversal in quantum mechanics?
9. Give an account of creation and annihilation operators.
10. What is Bhabha scattering**?**

SECTION – B

ANSWER ANY FIVE QUESTIONS: **(5 x 5 = 25)**

11. What is constant perturbation? Explain with example.
12. Explain contra and covariant vector with examples.
13. Describe the covariant nature of Dirac equations.
14. What is permutation operator? Mention its uses.
15. Explain quantization of free electromagnetic field
16. Explain the space inversion in quantum mechanics.
17. Compare Klein - Gorden field and Dirac's field**.**

SECTION – C

ANSWER ANY THREE QUESTIONS: **(3 x 15 = 45)**

18. Explain about Einstein coefficients and spontaneous emission**.**
19. (a) Explain momentum transformation.
    (b) Using relativistic mechanics describe Compton scattering**.**
20. Describe the radial equation for electron in a central potential.
21. Discuss in detail the symmetry transformations and conservation laws
22. Explain Lagrangian formulation quantum field theory for non-relativistic field.

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