ST. SAINTS COLLEGE LIBRARY TRIVANDRUM

(Pages : 3) H – 6264

Reg. No. : .....

Name : .....

Fifth Semester B.Sc. Degree Examination, December 2019

First Degree Programme Under CBCSS

Physics

Core Course V

PY 1541 – METHODOLOGY IN PHYSICS AND RELATIVISTC MECHANICS

(2014 Admission onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

(Very Short answer type questions. Answer **all** questions of **1** mark each)

1. Write any two objectives of Research
2. What is meant by qualitative research
3. Define extraneous variables in the context of Research design
4. What is meant by sample design in research
5. What are non-inertial frames of references?
6. Mention the consequences of Lorentz transformation.
7. What are non-inertial frames of references?
8. When is an equation said to be invariant under a transformation?
9. What is meant by relativity of simultaneity?
10. Explain time dilation in relativity.

(10 × 1 = 10 Marks)

P.T.O.

SECTION– B

(Short answer type questions. Answer any **eight** questions of **2** marks each)

11. What are the crireria for good research.

12. In the context of Research design,explaifl Research Hypothesis.

13. What is meant by dominant error? How can they be minimised?

14. Interpretation is a fundamental component of research process-Explain.

15. Calculate the energy equivalent of 1 mass unit, given Avogadro number 6.023×10^{23}.

16. Assuming Lorentz-Fitzgerald contraction, calculate the apparent length of a meter scale moving at a speed of 2.5×10^{8} m/s

17. A clock keeps correct time, With what speed should it be moved relative to an observer so that it may seem to lose 2 minutes in 24 hours.

18. Write the Hamiltonian for a simple pendulum

19. Prove that the generalized momentum conjugate to a cyclic coordinate is conserved

20. Prove that the Hamiltonian H of a conservative system is equal to the total energy of the systems

21. Discuss the concept of space and time in Special theory of Relativity.

22. Calculate the rest energy of an electron if the rest mass of the electron is 9.1×10^{-31} kg. **(8 × 2 = 16 Marks)**

SECTION– C

(Answer any **six** questions of **4** marks each)

23. Discuss any two problems faced by researchers in India.

24. Discuss on Research and scientific method.

25. What are the different types of energy?

26. Explain and illustrate the procedure of selecting a random sample.

27. Deduce the variation of mass with velocity.

28. Give examples to prove the relation $E=mc^2$.

29. Explain the concepts of Lorentz transformation.

30. Deduce the Hamilton's equations for Harmonic oscillator.

31. (a) From D'Alembert's principle deduce Hamilton's principle.

    (b) From Hamilton's Principle deduce Lagrange's equations.

(6 × 4 = 24 Marks)

SECTION– D

(Answer any **two** questions. Each question carries **15** marks)

32. What are the different types of Scientific Research. Discuss the development of scientific research in India.

33. Discuss the various procedure while unity the main text and conclusion of research thesis.

34. Discuss the Michelson – Morley expt and its results and their interpretations in the theory of relativity

35. What are Significant digits? Differentiate between absolute and relative errors. How are errors graphically represented. **(2 × 15 = 30 Marks)**
