Reg. No. : ....

Name : ....

Fifth Semester B.Sc. Degree Examination, December 2022

First Degree Programme under CBCSS

PHYSICS

Core Course V

PY 1541 – METHODOLOGY IN PHYSICS AND RELATIVISTIC MECHANICS

(2014-2017 Admission)

Time : 3 Hours   Max. Marks : 80

SECTION A

Answer **all** the questions. Each carries **1** mark.

1.   What do you mean by research?

2.   What is time dilation?

3.   Define fictitious force.

4.   What is relativistic optical shift?

5.   What is meant by error?

6.   Write down the Hamiltonian's equations of motion.

7.   What is meant by Galilean transformation?

8.   Define Hamilton's principle.

9.   What is null hypothesis?

10. What is tachyon?

(10 × 1 = 10 Marks)

SECTION B

Answer any **eight** questions. Each carries **2** marks.

11. What are the main criteria of the qualities of a good research?

12. What is twin paradox?

13. Explain centrifugal force and Coriolis force.

14. Write the difference between repeatability and replication of data.

15. Write a short note on random and systematic errors.

16. Explain error bars and graphical representation.

17. How do you find mass energy equivalence?

18. Why is literature survey important in research?

19. Define standard deviation. Write its formula?

20. Discuss the nature of generalized coordinates.

21. What is the difference between inertial and non-inertial frames of reference?

22. Explain variation of mass with velocity.

(8 × 2 = 16 Marks)

SECTION C

Answer any **six** questions. Each carries **4** marks.

23. Discuss the objectives of research in detail.

24. How fast would a rocket have to go relative to an observer for its length to be corrected to 99% of its length at rest?

25. Write a short note on :
    (a) special theory of relativity
    (b) the basic postulates of special relativity.

26. A student measures period of pendulum 5 times and the results are 2.9, 2.5, 2.7, 2.4 and 2.5 second. Find :

    (a) Arithmetic Mean

    (b) Standard Deviation.

27. A particle is moving in the direction in the earth's gravitational field. Write down the Hamiltonian and equation of motion of the particle.

28. Compare Lagrangian approach over Newtonian approach.

29. Explain different types of errors.

30. Write a short note on characteristic features of scientific methods.

31. Calculate the kinetic energy of an electron, moving with velocity of 0.98 c in the laboratory frame. (Rest mass of electron = 9.11×10^{-31} kg)

(6 $\times$ 4 = 24 Marks)

SECTION D

Answer any **two** questions. Each carries **15** marks.

32. Explain different types of research and criteria of good research.

33. Derive Hamilton's equation and equations for two-dimensional harmonic oscillator in polar coordinates.

34. Explain how to prepare a scientific journal.

35. Describe with relevant theory, Michelson-Morley experiment. Discuss the significance the result of the experiment.

(2 $\times$ 15 = 30 Marks)

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