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M – 1472

Reg. No. :

Name :

Fifth Semester B.Sc. Degree Examination, December 2021

First Degree Programme under CBCSS

Physics

Core Course V

PY 1541 – METHODOLOGY IN PHYSICS AND RELATIVISTIC MECHANICS

(2014, 2016 & 2017 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

(Answer **all** the questions. Each carries **1** marks.)

1. What is meant by proper length?
2. Define frame of reference.
3. Give the physical meaning of the mass energy equivalence.
4. Define generalized coordinates.
5. What is random error?
6. What is cyclic coordinates?
7. What is meant by proper time?

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8. Write two criteria of good research.
9. What do you mean by fictitious force?
10. How to determine the accuracy of the measurement?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Explain length contraction in special relativity.
12. Write down the Galilean transformation equations for coordinates.
13. What is meant by absolute and relative error?
14. What are the main characteristics of good research?
15. What are the implications of the equivalence between mass and energy?
16. Write a short note on tachyon.
17. Define space like and time like intervals.
18. What are the basic postulates of special theory of relativity?
19. What things are included in preliminary section of a thesis?
20. How is literature surveyed for research?
21. State the significance of Michelson-Morley experiment.
22. Explain error bars and graphical representation.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Prove that if Hamiltonian is not an explicit function of time, then Hamiltonian is a constant of motion.
24. Explain the different ways of data collection.
25. Obtain the Hamilton's equation of motion of one-dimensional harmonic oscillator in Cartesian coordinates.
26. Calculate the net force acting on a body of mass 5 kg moving with a uniform velocity of 4ms^{-1} .
27. Write a short note on qualities of good research.
28. Write down the derivation of Lagrange's equations from Hamilton's principle.
29. Explain mass energy equivalence.
30. Write a note on relativistic optical shift.
31. The length of a rod measured in an experiment is recorded as 2.51 m, 2.56 m, 2.49 m, 2.58 m, 2.48 m, 2.55 m respectively. Find the mean length, absolute error, mean absolute error.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Prove that generalized momentum conjugate to a cyclic coordinate is conserved. Show that the theorems of conservation of linear and angular momentum are contained in this general theorem.
33. Derive the relation between Lagrangian and Hamiltonian for a system in which the Lagrangian is not an explicit function of time.

34. Explain in detail about the objectives and motivation in research.
35. Derive Lorentz transformation equation.

(2 × 15 = 30 Marks)
