MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

Fifth Semester B.Sc. Degree Examination, November 2016
First Degree Programme under CBCSS
Core Course: Physics – IV
AUPY541: Methodology in Physics & Relativistic Mechanics

Time: **3** Hours Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in one or two sentences.*

1. What are tachyons ?
2. What is meant by percentage of error ?
3. What is Thesis ?
4. What is correlation analysis ?
5. What are the properties of the hypothetical medium ether ?
6. Mention ant two criteria of good research.
7. List the importance of tabulation of data.
8. What are the correct representation of $6.5678\ cm \pm 0.1\ cm$?
9. What are the basic principles of experimental design ?
10. What is synopsis ?

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. State the postulates of special theory of relativity.
12. What do you mean by literature survey ?
13. Explain the difference between research methods and research methodology.
14. What are inertial and non – inertial frames of reference ? Give an examples for both.

15. Distinguish between primary data and secondary data.
16. What are generalized momentum and cyclic coordinates.
17. What are the steps in solving testing of hypothesis problem ?
18. Explain the origin of fictitious forces in uniform rotational motion.
19. What are the objectives and motivations in research ?
20. What are the advantages of Newtonian, Lagrangian and Hamiltonian approach ?
21. Derive an expression for the variation of mass with velocity.
22. Distinguish between centrifugal forces and coriolis forces.

(8 × 2 = 16 Marks)

SECTION – C

*Short essay type / problems: Answer any **SIX** questions.*

23. The following readings are obtained when a resistance was measured : 1.34Ω, 1.38Ω,1.56 Ω,1.47 Ω,1.42 Ω,1.44 Ω,1.53 Ω,1.48Ω,1.40Ω and 1.59 Ω. Assuming that only random errors are present calculate the following :-
    i). Arithmetic mean.
    ii). Average deviation.
    iii). Standard deviation ; and
    iv). Variance
24. A spaceship moving away from the earth with velocity 0.5c fires a rocket whose relative velocity to the spaceship is 0.5c away from the earth .Calculate the velocity of the rocket as observed from the earth.
25. Explain how errors are represented graphically.
26. The rest mass of an electron is 9.1×10^{-31} kg. What will be its mass if it were moving with $(4/5)^{th}$ of the speed of the light.
27. Calculate the coriolis force on a mass of 100g place at a distance of 20 cm from the axis of a rotating frame of reference if the angular speed of the frame is 10rad/s.
28. Deduce the Hamiltonian function and equation of motion for a one dimensional harmonic oscillator.
29. Explain the different steps involved in a research process.
30. In Michelson –Morley experiment what is the expected fringe shift, if the effective length of earth path is 6m and light has 6000 Å wavelength.

31. Calculate the volume of a cube, if the proper length of each edge of the cube is l_0 and is moving with a velocity v along one of its edge.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type / problems: Answer any **TWO** questions.*

32. With the help of examples discuss how hypothesis, theories and laws are established, verified and falsified ?
33. Explain the uncertainties in measurement and different ways of estimation of errors
34. i). Derive Lorentz transformation equations.
    ii). Explain length contraction and time dilation.
35. Derive Hamilton's equations. Express it in Cartesian coordinate system.

(2 × 15 = 30 Marks)

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