



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**B.Sc. DEGREE EXAMINATION – MATHEMATICS**

**FIRST SEMESTER – NOVEMBER 2014**

**PH 1101 - PHYSICS FOR MATHEMATICS - I**

Date : 01/11/2014

Dept. No.

Max. : 100 Marks

Time : 01:00-04:00

**Part A**

**Answer all questions:**

**(10×2=20 marks)**

1. A fork lift moves 34 m carrying a 1023 N box across the warehouse floor. How much work is done by the fork lift?
2. State Newton's law of gravitation.
3. Define acceleration. Give its unit.
4. Determine the force required to increase the length of a steel wire by 1.25 times. Area of cross section of wire is  $5 \times 10^{-5} \text{m}^2$ . Given  $E$  for steel =  $2 \times 10^{11} \text{Nm}^{-2}$ .
5. Define escape velocity?
6. What are forces of cohesion and adhesion
7. Simplify  $Y = [A\bar{B}(C+BD) + \bar{A}\bar{B}]C$
8. Give the symbol of an EX-OR gate and its truth table.
9. What are inertial and non-inertial frames of reference?
10. A clock in a space ship emits signals at intervals of 1 second as observed by an astronaut in the space ship. If the space ship travels with a speed of  $3 \times 10^7 \text{ms}^{-1}$ , what is the interval between successive signals as seen by an observer at the control centre on the ground?

**Part B**

**Answer any FOUR questions:**

**(4×7.5 = 30marks)**

11. What are constraints? Explain its classification with examples.
12. Obtain the Lorentz transformation equations.
13. Derive Poiseuille's formula for the rate of flow of a liquid through a capillary tube.
14. Draw the circuit of a ring counter and discuss its working.
15. Derive an expression for energy of a satellite.
16. (a) Discuss in detail the length contraction.  
(b) A rod of 1 metre long is moving along its length with a velocity  $0.9c$ . Calculate its length as it appears to an observer (a) on the earth (b) moving with the rod itself.

**PART –C**

**Answer any FOUR questions:**

**(4×12.5 = 50 marks)**

17. Set up the Lagrangian and derive equations of motion for (a) simple pendulum  
(b) Atwood's machine.
18. (a) Derive Newton's law of gravitation from Kepler's law of planetary motion. **(5 marks)**  
(b) Define escape velocity and derive an expression for the same. **(7.5 marks)**
19. Outline the theory and experimental details for determining the angle of contact and surface tension of mercury by Quincke's method.
20. Explain with a neat diagram the working of a Half adder and a Full adder.
21. Deduce the formula for relativistic variation of mass with velocity. Explain its significance.
22. Describe Michelson – Morley experiment with a neat diagram and explain the physical significance of negative results.

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