



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIRST SEMESTER – **APRIL 2014**

PH 1101 - PHYSICS FOR MATHEMATICS - I

Date : 28/03/2014

Dept. No.

Max. : 100 Marks

Time : 09:00-12:00

PART A

Answer **ALL** the questions

(10 × 2 = 20)

1. What is holonomic constraint? Give an example.
2. Draw the distance – time and velocity – time graph for a particle moving with constant velocity.
3. What is meant by gravitational red shift?
4. State any two Kepler's laws of planetary motion.
5. Write Stoke's formula for surface tension.
6. State Hooke's law of elasticity.
7. Mention a few characteristics of an ideal op-amp.
8. Draw the circuit for AND and NAND gates and tabulate the truth table.
9. If 4kg of a substance is fully converted into energy, how much energy is produced?
10. State the two postulates of special theory of relativity.

PART – B

Answer any **FOUR** questions

(4 × 7.5 = 30)

11. Derive expressions for maximum height, time of flight and range of a body projected at an angle with the horizontal direction.
12. a) State Newton's law of gravitation. Give the unit of 'G'. (3)
b) Estimate the mass of the sun, assuming the orbit of the earth round the sun to be a circle. The distance between the sun and the earth is 1.49×10^{11} m and $G = 6.66 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$. (4.5)
13. Derive an expression to calculate the excess of pressure inside a soap bubble.
14. Simplify using K-map $Y = F(A,B,C,D) = \sum (1,3,5,7,9,11,12,13,14,15)$
15. Derive an expression for length contraction and time dilation. (4+3.5)

PART – C

Answer any **FOUR** questions

(4 × 12.5 = 50)

16. Solve Lagrange's equation for i) Simple Pendulum ii) Atwood's machine.
17. a) What is parking orbit? Calculate the velocity of satellite to be in it. (4)
b) Define escape velocity. Show that the escape velocity from the surface of the earth is 11km/s. (8.5)
18. Derive an expression to calculate the surface tension and angle of contact of mercury using Quincke's method. Explain the experimental method to calculate the same.
19. With a neat circuit diagram explain the construction and working of a J-K flip flop.
20. a) Deduce the formula for relativistic variation of mass with velocity. (10)
b) A particle of a mass 10×10^{-24} kg is moving with a speed of 1.8×10^8 m/s. Calculate its mass when it is in motion. (2.5)
