

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – PHYSICS

FIRST SEMESTER – APRIL 2013

PH 1101 - PHYSICS FOR MATHEMATICS - I

Date : 26/04/2013

Dept. No.

Max. : 100 Marks

Time : 1:00 - 4:00

PART – A

Answer **ALL** questions:

(10x2=20)

1. State the two postulates of general theory of relativity?
2. What is a parking orbit?
3. Define Relative velocity.
4. A wire 10 m long has a cross sectional area $1.25 \times 10^{-4} \text{ m}^2$. It is subjected to load of 5 kg weight. If Young's modulus for the material is $4 \times 10^{10} \text{ N/m}^2$, Calculate the elongation produced in the wire.
5. Distinguish between holonomic and non holonomic constraints.
6. Define coefficient of viscosity.
7. State the properties of an ideal Op-amp.
8. Draw the circuit of a binary half adder.
9. Distinguish between inertial and non inertial frames of reference
10. A particle of a mass $10 \times 10^{-24} \text{ kg}$ is moving with a speed of $1.8 \times 10^8 \text{ m/s}$. Calculate its mass when it is in motion.

PART – B

Answer any **FOUR** questions:

(4x7.5=30)

11. Derive an expression for maximum height, time of flight and range of a body projected at an angle with the horizontal
12. a) State the Kepler's law of planetary motion. (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 $1.49 \times 10^{11} \text{ m}$ and $G = 6.66 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$. (4.5)
13. Derive an expression for the moment of couple required to twist one end of a cylindrical wire when the other end is fixed.
14. Simplify using K-map $Y = F(A,B,C,D) = \sum (0,1,3,5,7,9,11,12,13,14,15)$
15. Derive Einstein's mass energy equivalence.

PART – C

Answer any **FOUR** questions:

(4x12.5=50)

16. Setup and solve the Lagrange's equation for i) Simple Pendulum ii) Atwood's machine. (6+6.5)
17. a) What is a Geo-stationary satellite? Define escape velocity. Show that the escape velocity from the surface of the earth is 11km/s. (7.5)
b) Write a short note on gravitational red shift. (3)
18. Derive an expression to calculate the surface tension and angle of contact of mercury by Quincke's method.
19. With a neat circuit diagram explain the construction and working of J-K flip flop
20. a) Deduce the formula for relativistic variation of mass with velocity. (8)
b) A rocket was found to be of length 100 m when measured on the earth. It then leaves and moves at a constant speed of $2 \times 10^8 \text{ m/s}$. What will be its length in motion? (2.5)

