LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

THIRD SEMESTER – **APRIL 2014**

PH 3104 - PHYSICS FOR MATHEMATICS - I

Date : 05/04/2014 Dept. No. Max. : 100 Marks

Time : 09:00-12:00

PART A

Answer **ALL** the questions (10 × 2 = 20)

1. What are the generalized co-ordinates in Lagrangian formulation?
2. Define Relative velocity.
3. State the principle of equivalence.
4. What is weightlessness?
5. Calculate the excess pressure inside a small air bubble of radius 10^{-4} m. Given the surface tension of water is $70x10^{-3}$ $Nm^{-1.}$
6. State Hooke's law of elasticity.
7. What is racing condition in J-K Flip-flop?
8. Define CMRR in an op-amp.
9. Write down the Galilean transformation equation if an object is moving along x-direction with a uniform velocity v in an inertial frame of reference.
10. A rocket was found to be of length 100 m when measured at rest on the earth. If it moves at a constant velocity of 2 x 10^8 m/s relative to the Earth, what will be its length?

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) Derive the relation between g and G. ***(2)***

    b) Estimate the mass and density of the earth by using the following data. Radius of the earth = 6371 km, G=6.66 x 10^{-11} Nm^2/kg^2 ***(5.5)***
13. Discuss Poiseuille's method for determining the coefficient of viscosity of a liquid.
14. With a neat circuit diagram, explain the working of an op-amp inverting amplifier.
15. Derive Einstein's mass energy equivalence.

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) State Newton's law of gravitation. Write the expression to calculate 'G' using Boy's method. ***(2.5+2)***

    b) Define escape velocity. Show that the escape velocity from the surface of the earth is 11km/s. ***(8)***
18. Obtain the relation between the three elastic moduli.
19. a) With a neat circuit diagram explain the construction and working of J-K flip flop. ***(10)***

b) Simplify using K-map. $Y=F(A, B, C) = \sum (1, 6, 7)$ ***(2.5)***

20. Describe the Michelson –Morley experiment and explain the physical significance of negative results.