



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIRST SEMESTER – NOVEMBER 2017

PH 1101 - PHYSICS FOR MATHEMATICS - I

Date: 07-11-2017
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

Part A

Answer **all** questions:

(10×2=20 marks)

1. Draw the velocity – time graph for a particle moving with constant velocity.
2. What are generalized coordinates?
3. Define escape velocity.
4. State Newton's law of gravitation.
5. Determine the force required to double the length of a steel wire of area of cross section $5 \times 10^{-5} \text{ m}^2$. Given E for steel = $2 \times 10^{11} \text{ Nm}^{-2}$
6. State Hooke's law and give its unit.
7. Draw the circuit of non – inverting operational amplifier
8. Draw the symbol of AND gate and give its truth table.
9. A rod of 1m long is moving along its length with a velocity $0.8c$. Calculate its length as it appears to an observer on earth.
10. What are inertial and non – inertial frames of reference?

Part B

Answer **any four** questions:

(4×7.5=30 marks)

11. What are constraints? Explain the different types of constraints with an example.
12. (a) Define gravitational potential. (2.5)
(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 $G = 6.66 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$.
13. Derive an expression for the moment of the couple required to twist one end of a cylinder when the other end is fixed.

14. Derive Poiseuille's formula for the rate of flow of a liquid through capillary tube.
15. Explain with a neat diagram the working of an op amp as an integrator.
16. Explain in detail length contraction and time dilation.

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 and Atwood's machine.
18. Explain in detail the Boy's method of determining the gravitational constant G.
19. Obtain the relations connecting three moduli of elasticity.
20. With a neat circuit diagram, explain the working of a full and half binary adder.
21. Describe Michelson Morley experiment with a neat diagram and explain the physical significance of negative results.
22. (a) Deduce an expression for the excess pressure inside a curved liquid surface.
(7.5 marks)
(b) Explain the molecular theory of surface tension. **(5 marks)**

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