LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2022**

17/18UPH1AL01 – PHYSICS FOR MATHEMATICS - I

Date: 01-12-2022 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

PART – A

Answer ALL questions **(10x 2 = 20 Marks)**

1 Draw the velocity – time graph for a particle moving with constant velocity.

2 A car travels at uniform velocity for a distance of 100 m in 4 seconds. What is the velocity of the car?

3 State any two Kepler's law of planetary motion.

4 Define coefficient of viscosity. Give its unit.

5 What are the forces of cohesion and adhesion?

6 Draw the symbol of an OR gate and give its truth table.

7 Draw the circuit of an inverting amplifier and give its output voltage.

8 Estimate the mass of the sun.

9 A rod of length 1m is moving along its length with a velocity 0.8c. Calculate its apparent length for an observer on earth.

10 What are inertial and non – inertial frames of reference?

PART – B

Answer any four questions **(4 x 7.5 = 30 Marks)**

11 Define simple harmonic motion. Explain displacement, velocity and acceleration in SHM.

12 Obtain an expression for the velocity of escape for an object projected from the surface of the earth.

Show that the escape velocity from the surface of the earth is equal to 11.2 km/s.

13 Derive Poiseuilles's formula for the rate of flow of a liquid through capillary tube.

14 Discuss in detail the relativistic length contraction and time dilation.

15 With a neat diagram, explain the working of an inverting operational amplifier.

16 Deduce Einstein's mass – energy relation.

PART – C

Answer any four questions **(4 x 12.5 = 50 Marks)**

17 What is a projectile motion? Deduce an expression for maximum height, horizontal range and time of flight for an object projected with a velocity u at an angle θ with respect to the horizontal.

18 (a) Define surface tension. Obtain an expression for the excess of pressure inside

(i) a spherical soap bubble and (ii) a spherical liquid drop. **(9 marks)**

(b)The pressure of air in a soap bubble of 7×10^{-3} m diameter is 8×10^{-3} m of water above the atmosphere pressure. Calculate the surface tension of the soap solution. **(3.5 marks)**

19 With a neat diagram, describe the Michelson - Morley experiment. Explain the physical significance of negative results.

20 (a) With circuit diagrams, explain the working of a half and full binary adders. **(9 marks)**

(b) Give the symbol and pin configuration of IC 741. **(3.5 marks)**

21 Discuss in detail the Boy's method of determining the gravitational constant G.

22 Obtain the relation connecting the three moduli of elasticity.

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