STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
END SEMESTER ONLINE EXAMINATION-November 2021

CLASS: I B.Sc. MATHEMATICS **MAX MARKS: 100**

CODE: 19PH/AC/PM13 **TIME : 180 MINS.**

PHYSICS FOR MATHEMATICS– I

SECTION – A

ANSWER ALL QUESTIONS: **(13 x 1 = 13)**

I. CHOOSE THE CORRECT ANSWER:

1. The work done is zero if ___________
   a) The body shows displacement in the same direction as that of the force applied
   b) The body shows displacement in the opposite direction of the force applied
   c) The body masses obliquely to the direction of the force applied
   d) The body shows a displacement in perpendicular direction to the force applied

2. If the external impressed force on the system is zero the total momentum of the system is ____
   a) Its initial kinetic energy b) Its initial potential energy c) zero d) Total Energy

3. The degree of freedom for a free particle in space are
   a) one (b) two (c) three (d) zero

4. The Lagrange's equations of motion for a system is equivalent to…… equations of motion.
   (a) Newton's (b) Laplace (c) Poisson (d) Maxwell's

5. Elastic energy stored per unit volume of a wire is
   a) Force x extension b) ½ (Force x extension) c) Stress/Strain
   d) ½ (Stress x strain)

6. Surface tension mainly arises due to
   a) Gravitational force b) Electrostatic force c) Cohesive molecular force
   d) Adhesive molecular force.

7. A frame of reference moving with a constant velocity relative to a fixed frame is called
   a) Inertial (b) non inertial (c) real (d) imaginary

8. For an object moving with very high speed
   a) length increases b) mass increases c) time decreases d) acceleration vary

II. FILL IN THE BLANKS:

9. When body is acted upon by a resultant force, then work done by the resultant force is equal to …….
10. ……………..constraints are independent of time.
11. Bulk modulus of an incompressible liquid is ___________
12. Water flowing with a speed of 8 m/s in 6 cm diameter pipe, is entering a narrow pipe of diameter 2 cm. Its speed in narrow pipe will be __________m/s.
13. If an object reaches the speed of light, it's length changes to…….

III. ANSWER BRIEFLY: (7 x 3 =21)

14. Differentiate centre of mass and centre of gravity.
15. When will you say the motion is simple harmonic and give examples?
16. What is virtual displacement?
17. Explain the term torsion and torque.
18. Draw Stress and strain graph and mark the important points.
19. Define critical velocity with reference to stream line flow and turbulent flow and what are the parameters on which it depends on.
20. Briefly explain Meson Paradox.

SECTION – B

ANSWER ANY FOUR QUESTIONS: (4x 9 = 36)

21. Derive an expression for the moment of the couple required to twist one end of a cylinder when the other is fixed with suitable diagram.
22. State the Lagrange's equation and apply it to the movement of simple pendulum.
23. A proton of mass 1.672×10^{-27}kg with a speed of 4×10^{3} m/s passes through an electric field for 2×10^{-7}sec and emerges with a speed of 8×10^{5} m/s. Calculate a) the initial momentum b) the final momentum, c) the impulse and d) Force.
24. A Steel wire of diameter 4.5×10^{-4}m extends by 2×10^{-3} m under a load of 1 kg and twists by 1.2 radians when subjected to a total torsional torque of 4×10^{-5} Nm at one end. Find the value of Young's modulus and Rigidity modulus.
25. The rest mass of electron is 9.11×10^{-31}kg.What is its momentum according to relativistic mechanics when it is moving down the axis of a linear accelerator tube at a speed of 0.4c relative to the accelerator tube also find its momentum as per classical mechanics.

SECTION – C

ANSWER ANY ONE QUESTION (1 x 30 = 30)

26. a) Define simple harmonic motion. Deduce expressions for the velocity, acceleration and periodic time of a body executing S.H.M. (15)

    b) Describe drop weight method to determine the surface tension of water and interfacial surface tension of water and kerosene. (15)
27. a) Derive an expression for the Young's modulus of a bar supported at the two ends and loaded in the middle and describe with suitable experiment to determine the same. (15)

    b) State the fundamental postulates of special theory of relativity. Derive Lorentz transformation equations. (15)