STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2008-09)

SUBJECT CODE : **PH/AC/PM13**

B.Sc. DEGREE EXAMINATION NOVEMBER 2008
BRANCH I - MATHEMATICS
FIRST SEMESTER

REG. No._____

COURSE : **ALLIED – CORE**
PAPER : **PHYSICS FOR MATHEMATICS – I**
TIME : **30 MINS.** MAX. MARKS : **30**

SECTION – A

TO BE ANSWERED IN THE QUESTION PAPER ITSELF

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I CHOOSE THE CORRECT ANSWERS:

1. When a body moves at high speed its mass
   a) increases b) decreases
   c) disappears d) remains unchanged

2. The kinetic energy of the body at higher speeds is
   a) (½) mv^2 b) mc^2 c) $2mv^2$ d) $(m-m_o)c^2$

3. Galilean frames are called
   a) accelerated frames b) inertial frames
   c) non-inertial frames d) alpha decay

4. Time dilation can be illustrated by
   a) beta decay b) meson decay c) proton decay d) alpha decay

5. The period of oscillation of bifilar pendulum about a vertical axis passing through its center of gravity is proportional to
   a) $T = 2\pi\sqrt{(I1/mg^2a)}$ b) $T = (\pi/2\sqrt{(I1/mga^2)}$
   c) $T = 2\pi\sqrt{(I1/mga^2)}$ d) $T = \pi\sqrt{(I1/mga^2)}$

6. When a spring is loaded the strain produced is
   a) longitudinal b) volumetric c) shearing d) bulk

7. In dimension formula of modulus of elasticity is
   a) $ML^{-2}T^{-1}$ b) $ML^{-2}T^{-2}$ c) $ML^{-1}T^{-2}$ d) MLT^{-2}

8. The work done is twisting the wire is stored up in the wire as
   a) kinetic energy b) potential energy c) total energy d) heat energy

9. In a drop weight method, a glass tube of external diameter 2mm is used and 100 drops of water are collected and its mass is 2.8grams. The surface tension of water in air is
a) 0.07221 N/m b) 0.07112 N/m c) 0.07012 N/m d) 0.7221 N/m

10. Rain drops are spherical in shape due to
a) viscosity b) gravity
c) elasticity d) surface tension

11. The thermo dynamical law which leads to the concept of temperature is
a) first law b) zeroth law c) second law d) third law

12. The change of entropy in a reversible process is
a) positive b) zero c) negative d) high value

13. Entropy is a measure of
a) perfect order b) available energy c) unavailable d) disorder

14. The third law of thermodynamics is called
a) uncertainity principle b) attainability principle
c) unattainability principle d) certainity principle

15. In the production of ultrasonics by magnetostriction method, the rod used is
a) ferromagnetic b) diamagnetic c) paramagnetic d) ferromagnetic

II FILL IN THE BLANKS:

16. The unit of entropy _____.

17. Ultrosonics are _____ sound waves.

18. The angle of contact in the case of water is_____.

19. The frame of reference in which Newton's first law of motion holds is _____.

20. In Lorentz transformation the velocity of light is _____.

III STATE WHETHER TRUE OR FALSE:

21. The entropy of system increases in all irreversible process.

22. The differential form of the first law of thermodynamics is dU = dQ + dW

23. The unit of surface tension is Nm.

24. Special theory of relativity deals with the problems that involve inertial frames of reference.

25. The critical velocity decides whether the flow of liquid is turbulent or streamline.

IV ANSWER BRIEFLY:

26. What is time dilation?

27. Define surface tension.

28. State the third law of thermodynamics.

29. What is a compound pendulum?

30. Define elasticity.

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SECTION – B

ANSWER ANY FIVE QUESTIONS: (5 x 6 = 30)

1. Explain the concept of length contraction in the theory of relativity.

2. Calculate the change in entropy when 10^{-2} kg of ice at 0°C is converted into water at the same temperature. The specific latent heat of fusion of ice is 3.36×10^5 J/kg.

3. At what speed a moving particle will have twice it rest mass?

4. What torque must be applied to a wire of one metre long, 10^{-3} in diameter in order to twist one end of it through 90°, the other end remaining fixed? The rigidity of the material of the wire is 2.8×10^{10} N/m^2.

5. A space craft is moving relative to the earth. An observer on the earth monitors that 3601 seconds elapses on a clock in the spacecraft for a duration of one hour on the earth. Calculate the spacecraft's speed relative to the earth.

6. A bar of length 1m, breadth 0.2m and thickness 0.005m is supported at its two ends and loaded in the middle. For a load of 0.4kg, the depression at the center is 2×10^{-3}m. Calculate the Young's modulus of the material of the bar.

7. Define stream line flow. Derive the Euler's equation of continuity of flow.

SECTION – C

ANSWER ANY TWO QUESTIONS: (2 x 20 = 40)

8. Derive the Lorentz space-time transformations.

9. Explain how ultrasonic waves are produced by Piezo-electric oscillator. Discuss the applications of ultrasonics.

10. Explain the term bending moment. Derive the expression for the bending moment of a thin uniform\bar of rectangular cross – section.

11. Describe the drop weight method to determine the surface tension of a liquid. Discuss the variation of surface tension with temperature.

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