STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2011-12 & thereafter)

SUBJECT CODE : 11PH/AC/PM13

B.Sc. DEGREE EXAMINATION NOVEMBER 2014
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. If bulk modulus of elasticity is 'k' then compressibility is
   a) 1/k b) $1/k^2$ c) $1/ k^{1/2}$ d) $k^{1/2}$

2. The depression at the free end of the cantilever is inversely proportion to
   a) length b) Young's modulus
   c) weight d) geometrical moment of inertia

3. Dimension of surface tension is
   a) ML^{-2} b) MLT^{-2} c) $M^{-2}T$ d) MT^{-2}

4. The angle of contact in case of water is
   a) 0^o b) 90^o c) acute d) obtuse

5. If a is area of cross-section, then according to equation of continuity the velocity of flow of liquid is
   a) proportional to a b) inversely proportion al to a
   c) equal to a d) square of a

6. For an isothermal process change in internal energy
   a) is zero b) increases with applied heat c) infinity d) constant

7. Zeroth law of thermodynamics helps to define
   a) pressure b) volume c) heat d) temperature

8. The change in entropy is zero during
   a) adiabatic process b) isothermal process
   c) ischoric process d) isobaric process

9. The ultrasonic waves will have a wave length of
   a) 0.0165 m b) 0.165 m c) 1.65 m d) 16.5 m

10. The ultrasonic frequency produced by piezo electric oscillator depends on
    a) The Youngs modulus of the crystal b) density of the crystal
    c) length of the crystal d) all the above

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11. The laws of physics are the same in all ……frames of reference.
    a) inertial b) non-intertial c) relative d) constant

12. The length of an object in motion as measured by an observer appears to him to be……
    a) shorter b) longer c) farther d) nearer

13. A liquid in motion is called streamline motion when the……..at every point in the liquid remains constant both in magnitude and direction.
    a) displacement b) velocity c) acceleration d) force

14. Unit of entropy is
    a) JK b) JS c) J / K d) JK^2

15. As temperature increases surface tension
    a) increases b) decreases c) remains constant d) none of the above

II STATE WHETHER TRUE OF FALSE:

16. Stress is defined as restoring force per unit area
17. The time period of torsional oscillation is independent of moment of inertia.
18. Speed of ultrasonic waves increases with increase in frequency.
19. Second law of thermodynamics give the condition under which heat can be converted to work.
20. An interval of time observed in a moving frame of reference will be more than the same interval in a stationary frame.

III FILL IN THE BLANKS:

21. The unit of Young's Modulus is …….
22. Small liquid drops acquire spherical shape due to ……..
23. According to postulate of special theory of relativity the velocity of light in free space is……..
24. The relativistic mass of a body ……with increase in velocity of the particle
25. Sound waves having frequencies above …….. Hz is called ultrasonic waves.

IV ANSWER BRIEFLY ALL THE QUESTIONS:

26. State Hooke’s Law

27. What is twin paradox?

28. What is neutral axis ?

29. State first law of thermodynamics.

30. What is piezo electric effect?

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TIME : 2½ HOURS MAX. MARKS : 70

SECTION – B

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

1. The volume of oil contained in a hydraulic press is $0.2m^3$. Find the decrease in volume of the oil when subjected to a pressure of 2.04×10^{27} N/M^2. The compressibility of the oil is 20×10^{-6} atm^{-1} (take 1 atom = 1.02×10^5 N/m^2).

2. 100 drops of water falling down a tube of external diameter 3.5 mm are collected under coconut oil of specific gravity 0.8. Calculate the interfacial tension between water and oil if the water collected weighs 12.35 gm.

3. Give some applications of ultrasonic waves.

4. Explain length contraction.

5. In a drop weight method for determination of Surface Tension between water and air a glass tube of external diameter 2mm is used and 100 drops of water are collected. The mass of these drops is 2.8gm find the Surface Tension of water in air.

6. A steel bar is suspended in a horizontal position by a vertical wire attached to its centre. A horizontal torque of moment 5 Nm twists the bar horizontally through a angle of 12^o. When the bar is released, it oscillates as a torsion pendulum with a period of 0.5 s. Determine the moment of Inertia.

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

SECTION – C

ANSWER ANY TWO QUESTIONS: (2x20=40)

8. Describe with relevant theory an experiment to determine the Young's modulus of the material of a bar by uniform bending.

9. a) Describe the expression for a period of oscillation of compound pendulum.
   b) Explain determination 'g' using compound bar pendulum.

10. Explain change in entropy in reversible and irreversible process.

11. a) State postulates of Einstein special theory of relativity and derive Einstein mass energy equivalence
    b) Derive Lorentz space-time transformation formula.

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