## STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI - 600086.

(For candidates admitted during the academic year 2015-16 \& thereafter)
SUBJECT CODE : 15PH/AC/PH13
B.Sc. DEGREE EXAMINATION NOVEMBER 2018

BRANCH I - MATHEMATICS
FIRST SEMESTER

| COURSE | $:$ | ALLIED - CORE |
| :--- | :--- | :--- |
| PAPER | $:$ | PHYSICS - I |
| TIME | $:$ | 3 HOURS |

MAX. MARKS : 100
SECTION - A

## ANSWER ALL QUESTIONS:

$(\mathbf{3 0} \times 1=30)$
I CHOOSE THE CORRECT ANSWER:

1. A wire is stretched through 1 mm by certain load. The extension produced in the wire of same material with double the length and double the radius will be
a) 4 mm
b) 3 mm
c) 1 mm
d) 0.5 mm
2. A liquid is flowing through a horizontal tube with velocity $2 \mathrm{~m} / \mathrm{s}$. Find the velocity of the liquid, if the radius is decreased by $20 \%$
a) $3.13 \mathrm{~m} / \mathrm{s}$
b) $1.13 \mathrm{~m} / \mathrm{s}$
c) $13 \mathrm{~m} / \mathrm{s}$
d) $1.33 \mathrm{~m} / \mathrm{s}$
3. In designing a beam for its use to support a load. The depression at centre is proportional to (where Y is youngs modulus)
a) $\mathrm{Y}^{2}$
b) Y
c) $1 / \mathrm{Y}$
d) $1 / \mathrm{Y}^{2}$
4. A force is applied on the wire of radius $r$ and length $L$ and change in the length of wire is 1 . If the same force F is applied on the wire of same length at twice the radius is
a) $1 / 2$
b) 1
c) $1 / 4$
d)none of these
5. The wettability of surface by a liquid depends primarily on
a) viscosity
b) surface tension
c) density
d) angle of contact between surface and the liquid
6. Consider two particle system of masses $m_{1}$ and $m_{2}$.If the first particle is pushed towards the centre through a distance $d$ then to keep the centre of mass constant the second particle should be moved through a distance.
a) $m_{2} d / m_{1}$
b) $m_{2} d /\left(m_{1}+m_{2}\right)$
c) $\mathrm{m}_{1} \mathrm{~d} / \mathrm{m}_{2}$
d) d
7. A particle executes simple harmonic oscillation with an amplitude a. The period of oscillation is T.The minimum time taken by the particle to travel half of the amplitude from the equilibrium position is
a) $T / 4$
b)T/8
c) $\mathrm{T} / 12$
d) $\mathrm{T} / 2$
8. The graph between restoring force and time in case of SHM is
a) straight line
b)circle
c) parabola
d) sine curve
9. If the distance between earth and sun were half its present value the number of days in a year would have been
a) 64.5
b) 129
c) 182.5
d) 730
10. The displacement of a particle is represented by the equation $y=\sin ^{3} \omega \mathrm{t}$. The motion is a)non-periodic b)periodic but not simple harmonic c)simple harmonic with a period $2 \pi / \omega$ d)simple harmonic with period $\pi / \omega$.
11. The unit of strain is
a)N
b)m
c) Ns
d)no unit

12 .If x is the displacement from mean position then the total energy of a particle executing simple harmonic motion is proportional to
a) $x$
b) $x^{2}$
c)independent of $x$
d) $x^{3}$
13. According to relativity a square in a accelerated frame will appear as, which of the following for a observer in a stationary frame of reference.
a) Sphere
b) circle
c) rectangle
d)parallelogram
14. The critical velocity of liquid depends on
a)viscosity
b)surface tension
c) pressure
d)temperature
15. The couple per unit twist of the wire is dependent on
a)length
b)radius
c) rigidity modulus
d) all of the above

## II. Fill in the blanks :

16. The centre of mass of a ring is at $\qquad$
17. The velocity of a particle executing simple harmonic motion is maximum at $\qquad$
18. The angle of contact for water is $\qquad$ -
19. Within $\qquad$ limit stress is proportional to strain.
20. Unaccelerated frame of reference is also called as $\qquad$

## III. True or False :

21. The centre of mass of a two particle system lies on the line joining the two particles, is closer to the heavier particle.
22. A particle performing SHM can have the same velocity at two instants in one cycle.
23. Time period of torsional oscillations is independent of moment of inertia.
24. If the temperature of a liquid is raised, then its surface tension is increased.
25. A moving clock appears to be slowed down for a stationary observer.

## IV. Answer Briefly :

26. What is centre of mass?
27. State Kepler's law of areas.
28. What is elasticity?
29. Define surface tension.
30. State postulates of special theory of relativity.

## SECTION - B

## ANSWER ANY FIVE QUESTIONS:

( $5 \times 5=25$ )
31. How fast would a rocket have to go relative to an observer for its length to be contracted to $99 \%$ of its length at rest?.
32. A body executing SHM when its displacement from the mean position is 4 cm and 5 cm and it has velocity $10 \mathrm{cms}^{-1}$ and $8 \mathrm{cms}^{-1}$ respectively, what is its time period?
33. A rectangular bar 0.02 m in breadth and 0.01 m in thickness and 1 m in length supported at its end on two knife edges .A 2 kg is hung in the middle .Calculate the depression if the young's modulus of the material of the bar is $2 \times 10^{10} \mathrm{~N} / \mathrm{m}^{2}$.
34. Calculate the force required to remove a flat circular plate of radius 0.02 m from the surface of water. Assume surface tension of water is $0.07 \mathrm{Nm}^{-1}$
35. Three masses $1 \mathrm{~kg}, 2 \mathrm{~kg}$ and 3 kg are placed at the vertices of an equilateral triangle of side 1 m . Find the centre of mass of the system.
36. Explain time dilation.
37. Find the time period for a torsional pendulum.

## SECTION - C

ANSWER ANY THREE QUESTIONS:
$(3 \times 15=45)$
38. Determine the centre of gravity of solid hemisphere and solid cone.
39. State and prove keplers law of areas and periods.
40. Find the expression for depression at the middle of a bar, subjected to non-uniform bending.
41. What is the meaning of mass-energy equivalence? Obtain Einstein's mass-energy relation.
42. Explain the method of determination of surface tension and interfacial surface by drop weight method.

