

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.  
(For candidates admitted during the academic year 2015-16 & thereafter)

SUBJECT CODE :15PH/AC/PH13

**B.Sc. DEGREE EXAMINATION NOVEMBER 2016**  
**BRANCH I - MATHEMATICS**  
**FIRST SEMESTER**

REG. No. \_\_\_\_\_

**COURSE : ALLIED – CORE**  
**PAPER : PHYSICS– 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 ANSWER:**

1. 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)  $m_2d/ m_1$                       b)  $m_2d/( m_1+ m_2)$                       c)  $m_1d/ m_2$                       d)  $d$
2. The maximum velocity of particle executing SHM with amplitude  $A$  is  
a)  $A\omega$                       b)  $A\omega^2$                       c)  $A/\omega$                       d)  $\omega/A$
3. According to Kepler's law of periods the time period and the distance between the planet and the sun is  
a)  $T=KR$                       b)  $T=KR^2$                       c)  $T^2=KR^3$                       d)  $T=KR^3$
4. The maximum velocity of a particle executing simple harmonic motion with an amplitude  $7\text{mm}$ , is  $4.4\text{ms}^{-1}$ .The period of oscillation is  
a)  $0.01\text{s}$                       b)  $10\text{s}$                       c)  $0.1\text{s}$                       d)  $100\text{s}$
5. The displacement of a particle is represented by the equation  $y=\sin^3 \omega t$ . 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  $\pi/\omega$
6. For a perfect rigid body, Young's modulus is  
a) zero                      b) infinity                      c) 1                      d) -1
7. Two wires of the same radii and material have their lengths in the ratio 1:2 if these are stretched by the same force, the strains produced in the two wires will be in the ratio.  
a) 1:4                      b) 1:2                      c) 2:1                      d) 4:1
8. The couple per unit twist of the wire is independent of its  
a) length                      b) radius                      c) rigidity modulus                      d) none of the above
9. Water flows through a horizontal pipe of varying cross section at the rate of  $0.2\text{m}^3\text{s}^{-1}$ .The velocity of water at a point where the area of cross section of the pipe is  $0.01\text{m}^2$  is  
a)  $2 \text{ms}^{-1}$                       b)  $20 \text{ms}^{-1}$                       c)  $200 \text{ms}^{-1}$                       d)  $0.2 \text{ms}^{-1}$

10. The angle of contact of mercury with glass is  
a)  $90^\circ$                       b)  $30^\circ$                       c)  $80^\circ$                       d)  $138^\circ$
11. The unit of surface tension is  
a) N                              b) Nm                              c)  $\text{Nm}^2$                       d)  $\text{Nm}^{-1}$
12. 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
13. The critical velocity of liquid depends on  
a) viscosity                      b) surface tension                      c) pressure                      d) temperature
14. The unit of strain is  
a) N                              b) m                              c) Ns                              d) no unit
15. 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)  $x^3$

**II FILL IN THE BLANKS:**

16. The centre of mass of two equal masses lies at \_\_\_\_\_ of the line joining the two masses.
17. At the extreme position the acceleration of the particle executing simple harmonic motion is \_\_\_\_\_.
18. When a liquid has concave meniscus the angle of contact of the liquid is \_\_\_\_\_.
19. Within \_\_\_\_\_ limit stress is proportional to strain.
20. Unaccelerated frame of reference is also called as \_\_\_\_\_.

**III STATE WHETHER TRUE OF 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 ALL THE QUESTIONS:**

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.

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**COURSE : ALLIED – CORE**  
**PAPER : PHYSICS– I**  
**TIME : 2½ HOURS**

**MAX. MARKS : 70**

**SECTION – B**

**ANSWER ANY FIVE QUESTIONS:**

**(5x5=25)**

1. Locate the centre of mass of a system of bodies of masses 1kg, 2kg, 3kg situated at the corners of an equilateral triangle.
2. A body executing SHM when its displacement from the mean position is 4cm and 5cm and it has velocity  $10\text{cms}^{-1}$  and  $8\text{cms}^{-1}$  respectively, what is its time period?
3. A sphere of mass 0.8kg and radius 0.03m is suspended from a wire of length 1m and radius  $5 \times 10^{-4}\text{m}$ . If the period of torsional oscillations of this system is 1.23 s, calculate the modulus of rigidity of the wire.
4. Calculate the force required to remove a flat circular plate of radius 0.02m from the surface of water. Assume surface tension of water is  $0.07\text{Nm}^{-1}$
5. 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?
6. Obtain the expression for bending moment.
7. What is the dimension of surface tension? Explain variation of surface tension with temperature

**SECTION – C**

**ANSWER ANY THREE QUESTIONS:**

**(3x15=45)**

8. Determine the centre of gravity of solid sphere and solid cone
9. Explain the theory of compound pendulum.
10. Find the expression for depression at the middle of a bar, subjected to non-uniform bending.
11. What is the meaning of mass-energy equivalence? Obtain Einstein's mass-energy relation.
12. Explain the method of determination of surface tension and interfacial surface by drop weight method.

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