

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

SUBJECT CODE : 15PH/MC/ME34
B.Sc. DEGREE EXAMINATION NOVEMBER 2016
BRANCH III - PHYSICS
THIRD SEMESTER

REG. No. _____

COURSE : MAJOR – CORE
PAPER : MECHANICS
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:

- The dimensions of impulse are
a) MLT^{-2} b) $ML^{-1}T^{-1}$ c) MLT^{-1} d) M^0LT^{-1}
- If the total external force acting on a system is equal to zero then the total linear momentum is
a) Conserved b) Not conserved c) zero d) None of the above
- For elastic bodies, the value of coefficient of restitution (e) is
a) 0 b) 1 c) < 1 d) > 1
- A physical quantity which gives the state of oscillation of a particle performing SHM at time (t = 0) is called the ____ of SHM
a) Phase b) angular frequency c) epoch d) amplitude
- Total energy in a Damped Oscillations _____ with time
a) Increases Linearly b) Decreases Linearly
c) Increases Exponentially d) Decreases Exponentially
- The maximum displacement of a body from its mean position is
a) Time Period b) frequency c) vibration d) amplitude
- The moment of inertia of any section about an axis passing through its centre of gravity is
a) Maximum b) depends upon the shape of the section
c) Minimum d) depends upon the dimension of the section
- The moment of inertia of a rectangular bar about an axis through 'G' and perpendicular to its plane is given by
a) $I = \frac{M(l^2 + b^2)}{12}$ b) $I = \frac{M(l+b)^2}{2}$ c) $I = \frac{M(l^2)}{12}$ d) $I = \frac{M(l^2 + b^2)}{2}$
- When the axis of suspension of compound pendulum is passing through C. G, then the period of oscillations is
a) Maximum b) Minimum c) Zero d) None of the above
- The point of intersection of the lines of action of the weight of all the points of body is called.
a) Centre of body b) Centre of gravity of body
c) Centre of mass of the body d) None of the above

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TIME : 2 ½ HOURS **MAX. MARKS : 70**

SECTION – B

ANSWER ANY FIVE QUESTIONS: (5 x 5 = 25)

1. Discuss the oblique impact between two smooth spheres.
2. A ball impinges directly on an exactly equal and similar ball lying on smooth horizontal table. If 'e' is the coefficient of restitution prove that after impact, the velocity of B is to that of A are $(1 + e:1 - e)$.
3. What is the frequency of a 2 metre long simple pendulum? Assuming small amplitude, what would be its frequency in an elevator accelerating upward at a rate of 2m/s^2 ?
4. A circular disc of mass 100g and radius 10cm is making 120rpm about an axis passing through its centre and perpendicular to its plane. Calculate its kinetic energy.
5. A solid cone and a solid hemisphere of the same material have a common base. Find the ratio of the height of the cone to the radius of the hemisphere, if the CG of the combination coincides with the centre of the common base.
6. The Lagrangian of the system in terms of generalized coordinates x and y is given by $L = x y - xy$. Find the Lagrangian equation of motion.
7. Apply Lagrange's equation of motion to the Atwood's machine to find the acceleration of the system.

SECTION – C

ANSWER ANY THREE QUESTIONS: (3 x 15 = 45)

8. Deduce the expressions for the velocities of two smooth spheres after direct impact and hence obtain their loss of kinetic energy.
9. What are forced vibrations? Deduce the theory of the phenomena of forced vibrations and resonance. Also discuss the phenomenon known as the sharpness of the resonance.
10. Define compound pendulum. Give the theory of compound pendulum. Explain the reversibility of centre of oscillation and centre of suspension.
11. a) Discuss CG of a compound body.
b) Determine the centre of gravity of solid tetrahedron.
12. Derive Lagrange's equation of motion from D'Alembert principle for a conservative system.

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