SUBJECT CODE : 11PH/MC/ME24

B.Sc. DEGREE EXAMINATION APRIL 2013
BRANCH III – PHYSICS
SECOND 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 THE QUESTIONS: (30 × 1 = 30)
I   CHOOSE THE RIGHT OPTION:
1.   The formula of impulse is _____.
     a) Time/Force   b) Force x distance   c) Force/Time   d) Force x Time

2.   An important property of a hodograph is that acceleration of a point at any point on the curve can be represented in _____.
     a) Magnitude   b) Direction
     c) Magnitude and Direction   d) None

3.   The K.E lost during direct impact is _____
     a) Sound   b) Heat
     c) Vibration or Rotation of the colliding bodies   d) All the above

4.   The differential equation representing the free vibration of a body is
     $\frac{d^2y}{dt^2} + \omega^2 y = 0$ The natural frequency of the body is _____.
     a) $2\pi/\omega$ b) $\omega/2\pi$ c) ω d) ω^2

5.   A system is executing damped vibration and is further subjected to an external periodic force differing in frequency. The total system _____.
     a) will be in resonance   b) will be under damped
     c) will not be in resonance   d) will be over damped

6.   The average K.E of a harmonic oscillator is 5 joules. The total energy of the oscillator at any instant is _____.
     a) 5 Joules   b) 10 Joules   c) 15 Joules   d) 20 Joules

7.   The unit of M.I is _____.
     a) Kgm   b) Kg/m^2 c) Kgm^2 d) gmcm

8.   The M.I of the solid sphere about the tangent T is _____.
     a) $2/5\ MR^2$ b) $5/7\ MR^2$ c) $\frac{1}{2}\ MR^2$ d) $7/5\ MR^2$

9.   The value of 'g' is _____.
     a) 9.80665 ms   b) 9.80665 m/s
     c) $9.80665\ ms^2$ d) $9.80665\ m/s^2$

10. The C.G of the solid hemi-sphere is on its axis at a distance_____ from the centre.
   a) 8/3 r   b) 3/4 h   c) 3/8 r   d) r/2

11. The Mass of a particle at the centre of the earth is _____.
   a) Zero   b) Same as at other places
   c) Infinite   d) >the original mass

12. The weight of a particle at the centre of the earth is _____.
   a) Zero   b) Same as at other places
   c) Infinite   d) > the original mass

13. The conservation of linear momentum is _____.
   a) Newtons I law of motion   b) Newtons II law of motion
   c) Conservation of angular momentum   d) Newtons III law of motion

14. In Atwood's machine, there is _____ coordinates.
   a) Only one dependent   b) Cartesian
   c) Only one independent   d) generalised

15. The walls of the gas vessel constitute a _____ constraints.
   a) Scleronomic   b) Holonomic
   c) Rheonomic   d) Non-holonomic

II.   FILL IN THE BLANKS:

16. Centrifugal force is a fictitious force and holds good in a rotating _____.

17. When the amplitude of a particle executing S.H.M increases, its time period _____.

18. In a compound pendulum, the time period will be minimum when points of suspension and oscillation are equidistant from the _____.

19. The C.G of a hollow hemisphere is on its axis at a distance _____ from the centre.

20. The generalised coordinates of a material system are the _____ parameters, which completely specify the configuration of the system.

III.   STATE WHETHER TRUE OR FLASE:

21. When a perfectly elastic sphere impinges on a fixed smooth plane its velocity is unaltered in magnitude.

22. The necessary and sufficient condition for S.H.M is inversely proportional to restoring force and displacement from equilibrium position.

23.   In a compound pendulum the centre of suspension and the centre of oscillation are interchangeable.

24.   The C.G of the cone is along its axis at a distance of 3/8 h from the vertex.

25.   The number of mutually independent variables required to define the state or position of a system is the number of degrees of freedom.

IV.   ANSWER BRIEFLY

26.   What is collision? What are the types of collision?

27.   Give an example of forced vibration.

28.   State parallel axis theorem.

29.   Define centre of gravity.

30.   What are constraints?

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TIME   :   **2 ½ HOURS**   Max. Marks : **70**

SECTION B
ANSWER ANY **FIVE** QUESTIONS: $(5 \times 5 = 25)$

1. A ball of mass 8Kg, moving with a velocity of 10ms^{-1} impinges directly on another mass 24Kg, moving at 2ms^{-1} in the opposite direction. If e=0.5, find the velocities of the balls after impact.

2. A particle moves in a straight line and has potential energy
    $U_x = x^2 - 9x^2 + 24x$
    a) Calculate force F_x experienced by the particle
    b) Find the work done when the particle moves from x= a to b.

3. A circular disc of mass100 grams and radius 10cm is making 120rpm about an axis passing through its centre and perpendicular to its plane. Calculate its kinetic energy.

4. 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 C.G of the combination coincides with the centre of the common base.

5. State and explain D'Alembert principle.

6. A heavy uniform rod of length 90cm swings in a vertical plane about a horizontal axis passing through its one end. Calculate the position at which a concentrated mass may be placed so that the time of swing remains unaltered.

7. A steel ball is let fall through a height of 0.64m on a plate of steel. The height through which it rebounds is 0.36m. Calculate the coefficient of restitution.

SECTION – C
ANSWER ANY **THREE** QUESTIONS: $(3 \times 15 = 45)$

8. Explain the following
    a) direct impact of two smooth spheres
    b) oblique impact of two smooth spheres.

9. State and prove Fourier theorem and explain any one of the application.

10. How will you determine the acceleration due to gravity 'g' using bifilar pendulum.

11. Find the position of C.G in the following cases.
    i) Compound body   ii) Remainder   iii) Solid tetrahedron.

12. Derive the Lagrange's equation of motion.

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