ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI – 110054

Class 11 Time : 1½ hrs.

21-12-2017 Pre-Annual Test in PHYSICS M. Marks : 40

1. Is it necessary that centre of mass always lies at the geometrical centre of an object? Give reason for your answer. (1)

2. Why the highest point is considered to be the critical point during a vertical circular motion? (1)

3. The moment of inertia of a disc about an axis passing through the diameter is $MR^2/4$. What is the moment of inertia about an axis passing through the edge and parallel to the diameter? (1)

4. State perpendicular axis theorem. Apply this theorem to obtain the moment of a uniform ring about its diameter. (2)

5. Prove that when a particle suffers an oblique elastic collision with another particle of equal mass initially at rest would move in mutually perpendicular directions after collision. (2)

6. If the two vectors **A** and **B** are perpendicular to each other find the value of 'm'
A = **2i**-2**j**-5**k** **B**= -**i**+m**j**-2**k** (2)

7. Find a unit normal vector which is perpendicular to both **A** and **B**. Given;
A = **9i**-2**j**-**5k** **B**= -2**i**+2**j**-5**k**
Write the condition at which **A . B** = |**A**X**B**| (3)

8. Derive the expression for acceleration of a circular object released from top of an inclined plane. Assume that object is rolling down the inclined plane without slipping. (3)

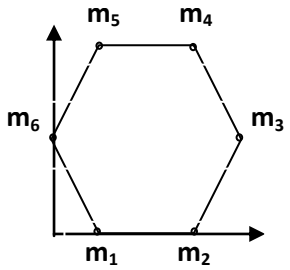
9. A bullet of mass 0.012kg and horizontal speed 70m/s strikes a block of wood of mass 0.4kg and instantly comes to rest with respect to the block. The block is suspended from the ceiling by means of a thin mass less wire. Calculate the height to which the block rises and also calculate the amount of heat energy produced. (3)

10. Two discs of moment of inertia I_1 and I_2 about their axis normal to the plane and passing through the center rotating with the angular velocities ω_1 and ω_2 are brought to contact so that they rotate with the same angular velocity. Show that there is always loss of kinetic energy. (3)

11. Write a difference between horizontal circular motion and vertical circular motion. Derive the expression for minimum velocity required at the lowest point of a vertical circular motion. (3)

12. A spin drier starts from rest and accelerates uniformly and acquires an angular velocity of 120rpm in 5 seconds and then continues with the same angular velocity for 5 minutes and finally brought to rest in 20s. Calculate the angular velocity and number of rotations completed during the motion. (3)

13. Six particles are placed at vertices of a regular hexagon of side 'l' as shown in the figure.
Find the position vector of centers of mass.
Where $m_1 = m_3 = m_5 = 2kg$. and $m_2 = m_4 = m_6 = 4kg$. (3)



14. What do you mean by restoring force? Write the relation between restoring force and stretch. Explain how spring is stretched to store energy and derive the expression for potential energy stored in the spring. Graphically, show the variation of potential energy with elongation produced. (5)

15. What do you mean by banking of roads? Why banking is required on high speed tracks? Derive an expression for maximum velocity with which a vehicle can negotiate on the

banked road. (5)

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