INDIAN SCHOOL SOHAR
SECOND TERM EXAM- 2016
PHYSICS – THEORY

CLASS: XI   **MARKS:70**
DATE: 22 /11/2016   **TIME: 3hrs**

General Instructions:
1. All questions are compulsory.
2. There are 26 questions in all .Questions 1 to 5 carry one mark each, questions 6 to 10 carry two marks each, questions 11 to 22 carry three marks each. Question 23 is a value based question carrying four marks and questions 24 to 26 carry five marks each.
3. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each.
4. You have to attempt only one of the given choices in such questions.
5. Use of calculator is not permitted.
6. You may use the following physical constants wherever necessary.

SECTION-A

1. A particle is thrown from a point with a speed v_0 at an angle of projection θ. From the same point and at the same instant,a person starts running with constant speed $\frac{v0}{2}$ to catch the ball. Will the person be able to catch the ball? if yes, what should be the angle of projection ?   1

2. If both speed of a body and radius of the circular path are doubled, what will be the change in centripetal force ? why? Show using the formula.   1

3. What is moment of inertia of (a) solid sphere about its diameter (b) hollow sphere about its axis? Write down the formula.   1

4. "Droplet of water doesn't stick to a leaf". Justify.   1

5. Name four fundamental force of nature and arrange them in increasing order of their strength. 1

SECTION -B

6. A physical quantity P is related to four observables a, b, c and d as follows.
    P =a^2 b^2 $/\sqrt{cd}$
The percentage errors of measurement in a, b, c and d are 1%, 3%, 4% and 2% respectively. What is the percentage error in the quantity P? If the value of P calculated using the above relation turns out to be 3.763. What the error in P.   2

7. Velocity graph of a moving object is shown below. What is acceleration of object? Also draw displacement- time graph for the motion of object.   2

1
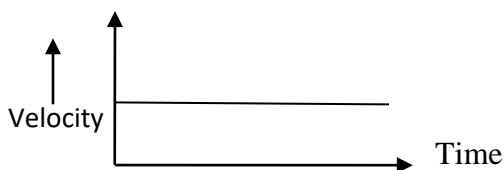
8. A body is thrown up with a velocity of 78.4 ms^{-1}. Find how high will it rise and how much time it will take to return to its point of projection.   2

9. Obtain an expression for orbital velocity of a satellite.   2

OR

9. Derive an expression for acceleration due to gravity at a depth 'd' below the surface of the earth.

10. Derive an expression for surface energy with the help of an activity. Hence define it.   2

SECTION -C

11. Define Young's modulus of elasticity. Describe an experiment to find Young's modulus in laboratory.   3

12. The distance between earth and moon is 3.8×10^5 km and the mass of the earth is 81 times the mass of the moon. Deduce the position of a point on the line joining the centres of earth and moon, where the gravitational field is zero.   3

13. Define guage pressure. Derive an expression for the guage pressure for a cylindrical element of water in a beaker of water.

14. What is moment of inertia of
(a) a rigid massless rod of length "l" with a pair of small masses M/2 at it ends rotating about an axis through the center of mass perpendicular to the rod.
(b) a rod of mass M length l about an axis perpendicular to the rod through one of the ends of the rod.   3

15.(a) Obtain an expression for the gravitational potential energy.
(b) If a person goes to a height equal to the radius of the earth from its surface, what would be his weight relative to that on the earth.   3

16.(a)Define modulus of rigidity.
(b) A 4m long aluminium wire whose diameter is 3mm is used to support a mass of 50 kg. What will be the elongation of the wire? Y for aluminium is 7×10^{10} Nm^{-2}. Given g=9.8 ms^{-2}
   3

17. A ball A is just dropped from a height h. Simultaneously ,another ball B is thrown vertically upwards from ground with a speed $\sqrt{gh}$. After what time will they meet and at what height?   3

18. What is viscous drag force. Derive an expression for terminal velocity.   3

19. (a)Derive an expression for capillary rise. When can say that a miniscus in the capillary is concave or convex.   3

20.Derive Newton's second law of motion for a rotating particle and hence generalise it for system of particles.   3

21. Three blocks are connected as shown in figure on a horizontal frictionless table and pulled to the right with a force F = 50 N. If m_1=5kg, m_2=10 kg and m_3 = 15kg, find the tensions T_1 and T_2. 3
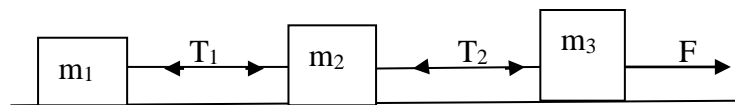
22. Establish the kinematic equations of motion from velocity time graph of a uniformly accelerated motion.   3

OR

22. State the parallelogram of vector addition. Hence deduce the law of sines with the help of diagram.   3

SECTION-D

23.Construction for metro lines was carried out day and night. One night, when the work was in full swing, suddenly chain of the crain, lifting a heavy concrete block snapped and fell down. Immediately people from nearby area came for help. They lifted the concrete and saved many lives.

(a) What values of locals helped in saving lives?

(b) A crane having steel ropes is used to lift heavy loads upto 10^4kg. The elastic limit for steel is 3×10^8Nm^{-2}. What should be the radius r of the steel rope used?   4

SECTION-E

24.State the theorem of perpendicular axis with the help of diagram.

(b) What is the moment of inertia of a ring with axis of rotation along the diameter. Derive with the help of diagram.

(c) A solid sphere of mass 0.1kg and radius 2.5 cm rolls without sliding with a uniform velocity of 0.1m/s along a straight line on a smooth horizontal table find the total energy.

OR

24. (a) Define and explain the scalar product of vectors with the help of diagram and mention all its properties.

(b) A group of cloud at a height of 500m above the earth bursts and rainfall covers an area of 10^6 m^2 with a depth of 2cm how much work would have been done in raising water to the height of clouds.   5

25. (a) State the force law for a spring. Derive an expression for the work done by the spring force in expanding and compressing the spring with the help of diagram.

(b) A wire cable 10m long consists of 40 strands of steel each 5×10^{-6}m^2 in cross – section. By how much does the cable stretch when it is used to lift a crate weighing4000N? Y of steel is 20×10^{10} N/m^2.

OR

25.(a) When can you say that a material is brittle or ductile. Support your answer with the help of stress and strain curve.

(b) Two springs have force constants k1 and k2 (k1 > k2). On which spring is more work done when they are stretched by the same force?   5

26. (a)State and explain the Kepler's laws of gravitation with the help of diagram.

(b)What should be the weight of a body at the centre of the Earth.

OR

26. (a) Define escape velocity. What should be the velocity of body such that it escape into space. Derive an expression.

(b) Assume that earth and mars move in circular orbits around sun. With the martian orbit 1.52 times the orbital radius of the earth. What is the length of martian year in days ?   5