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INDIAN SCHOOL SOHAR
FIRST TERM EXAM- 2018
PHYSICS – THEORY

CLASS: XI **MAXIMUM MARKS: 70**
DATE: 16/9/2018 **DURATION: 3Hrs**

General Instructions:
1. All questions are compulsory.
2. There are 27 questions in all .Questions 1 to 5 carry one mark each, questions 6 to 12 carry two marks each, questions 13 to 24 carry three marks each, questions 25 to 27 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

SECTION-A

1. Draw the variation of kinetic energy, potential energy and total energy stored in a spring as a function of extension. (1)

2. Mention the number of significant figures in the following:

(i) 0.0006032 m^2 (ii) 2.64×10^{24} kg (1)

3. What is the angle of projection at which the Range of projectile is maximum. (1)

4. State the work energy theorem for constant force. (1)

5. Mention the moment of inertia of (i) a circular disc of radius 'R' about its diameter

(ii) a thin rod of length 'L' about an axis perpendicular to the rod, at its mid-point. (1)

SECTION-B

6. Name the field with which microscopic and macroscopic domain of physics deals. (2)

7. Derive an expression for the kinetic energy of a rolling body. (2)

8. The resistance R = V/I where V = (100±5) V and I = (10±0.2) A. Find the percentage error in R. (2)

9. An electron travelling with a speed of 5×10^3 m/s passes through an electric field with an acceleration of 10^{12} m/s^2. How long will it take for the electron to double its speed. (2)

10. For a velocity vector **v** in the x-y plane show $\mathbf{v} = v_x \mathbf{i} + v_y \mathbf{j}$. (2)

11. A constant retarding force of 50N is applied to a body of mass 20 kg moving initially with a speed of 15 m/s. How much time does the body take to stop? (2)

12. Derive an expression to show the relation between torque and angular acceleration of a rotating body.

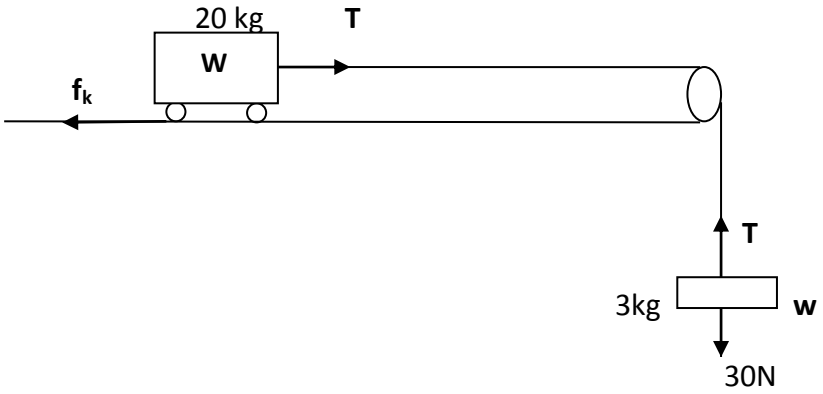
OR

12. Define scalar product of two vectors with the mathematical expression. Hence find the values of **i.i** and **i.j.** Justify your answer. (2)

SECTION-C

13. A block and a trolley system is shown in the figure below. If the coefficient of kinetic friction between the trolley and the surface is 0.04.Find the (i) tension in the string

(ii) acceleration of the block and the trolley system. (3)



14. (a) Define instantaneous and average acceleration. Write down its mathematical expression.

(b) Draw a position time graph for motion a body with (i) positive acceleration (ii) negative acceleration.

OR

14. Define instantaneous velocity. Write down its mathematical expression. Describe the graphical method of obtaining the direction of instantaneous velocity. (3)

15. Derive an expression for the loss of kinetic energy for a completely inelastic collision in one dimension. (3)

16. A woman pushes a trunk on a railway platform which has a rough surface. She applies a force of 100 N over a distance of 10m. Thereafter , she gets progressively tired and her applied force reduces linearly with distance to 50 N. The total distance through which the trunk has been moved is 20 m. Plot the force applied by the woman and the frictional force, which is 50 N versus displacement. Calculate the work done by the two forces over 20m. (3)

17.Derive an expression for the work done by a variable force with the help of graphical representation. (3)

18. Explain with the help of diagram the condition to be obtained for a body to be in

equilibrium when (i) two forces (ii) three forces (iii) n forces are applied on the body. (3)

19. State the principle of homogeneity. Hence test correctness of the equation F=ma. (3)

2o. (a) Define uniform motion along a straight line.

(b) A body goes from A to B with a velocity of 40 m/s and comes back from B to A with a velocity of 60 m/s. What is the (i) average velocity during the whole journey and (ii) average speed during the whole journey? (3)

21.(a)State the triangle law of vector addition.

(b) The position vector of a particle is given by $\mathbf{r} = 5\,\mathbf{i} + 2t^2\,\mathbf{j} + 3t\,\mathbf{k}$ (i) find **v** (t) and **a** (t)

(ii) find the magnitude magnitude of **v** (t) at t = 1 sec. (3)

22. Obtain an expression for kinetic energy of a rotating body and hence define moment of inertia. (3)

23. (a) Mention the condition for a body to be in rotational equilibrium. Mention the mathematical expression.

(b) Find the moment of inertia of a ring about a tangent to the circle of the ring? (3)

24. Define a projectile. A cricket ball is thrown at speed of 28 m/s in a direction 30^0 above the horizontal. Calculate the maximum height it can reach and the time taken by it to reach the maximum height. (3)

SECTION-D

25. (a) With the help of a diagram obtain an expression for the maximum possible speed that can be obtained by a car on a leveled road.

(b) Find the angle between $\mathbf{F} = 2\,\mathbf{i} + \mathbf{j} - 3\,\mathbf{k}$ and $\mathbf{d} = \mathbf{i} - 2\,\mathbf{j} - \mathbf{k}$.

OR

25. (a) State Hooke's law for a spring. Hence obtain an expression for the work done by a stretched spring on a block attached to it at one end and tied to a rigid support at the other end.

(b) The potential energy of a spring when stretched through a distance "x" is 25 J. What is the amount of work done on the same spring so as to stretch it by an additional distance "5x". (5)

26. Derive an expression for the (i) path (ii) range (iii) time of flight of a projectile with the help of a diagram.

OR

26. (a) Define an uniform circular motion.

(b) Describe the graphical method of finding the direction of centripetal acceleration.

(c) Derive an expression for centripetal acceleration. (5)

27. (a)State the theorem of perpendicular axis with the help of diagram.

(b) Define centre of mass of a body.

(c) Two particles of mass 2 kg and 1 kg are moving along the same line with speeds 2m/s and 5m/s respectively. Find the speed of the centre of mass of the system if both the particles are moving (i) in same direction (ii) in opposite direction.

OR

27.(a) State the theorem of parallel axis with the help of diagram.

(b) Three bodies a ring, a solid cylinder and a solid sphere roll down the same inclined plane. Find which of the three bodies has minimum velocity. (5)