MANAS RAI
XI-A
ROLL NO - 23

GURU HARKRISHAN PUBLIC SCHOOL
(Running under the aegis of GHPS Society)
HALF YEARLY EXAMINATION (2017-2018)
SUBJECT-PHYSICS
CLASS-XI

TIME ALLOWED: 3 HOURS **M.M.: 70**

General Instructions:

(i) All questions are compulsory.
(ii) There are **26** questions in total. Question Nos. **1** to **5** are very short answer type questions and carry **one** mark each.
(iii) Question Nos. **6** to **10** carry **two** marks each, Question Nos. **11** to **22** carry **three** marks each and Question Nos. **24** to **26** carry **five** marks each.
(iv) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have attempt only one of the given choices in such questions.
(v) Question No.**23** is value based question carries **four** marks.
(vi) Use of calculators is not permitted. However, you may use log tables if necessary.

SECTION - A

1. What is a conservative force? (1)

2. Can x – t graph be a straight line parallel to position axis? Justify your answer. (1)

3. A bus weighing 900 kg is at rest on the bus stand. What is the linear momentum of the bus? (1)

4. Which of the following measurement is more accurate and why? (1)
(a) 0.0002 g (b) 20.0 g

5. What is the value of $\vec{A} \times \vec{A}$? (1)

SECTION - B

6. Derive the equation of motion for uniformly accelerated motion from velocity – time graph. by graphical method. (2)

$$S = ut + \frac{1}{2}at^2$$

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7. State the law of conservation of linear momentum and derive it from Newton's third law of motion. (2)

OR

A stone of mass 5 kg falls from the top of a cliff 50 m high and buries 1 m deep in sand. Find the average resistance offered by the sand and the time it takes to penetrate.

8. Name four fundamental forces in nature? Out of the four which one is (a) strongest (b) weakest. (2)

9. Derive work – energy theorem for a variable force. (2)

10. From the top of a tower 100 m in height a ball is dropped at the same time another ball is projected vertically upwards from the ground with velocity of 25 ms^{-1}. Find when and where the two balls will meet. Take $g = 9.8\ ms^{-2}$. (2)

SECTION – C

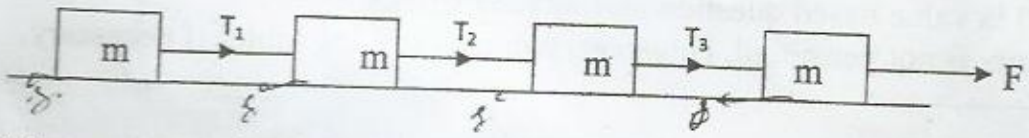
11. Show graphically the displacement vector for a motion in two dimensions. Derive an expression for displacement vector in terms of its rectangular components. (3)

12. Show that Newton's second law of motion is the real law of motion. (3)

13. Draw a plot of spring force F_s and displacement x. Hence find an expression for the potential energy of an elastic stretched spring. (3)

14. Describe the parallax method for the determination of the distance of a nearby star from the earth. (3)

15. Four blocks of the same mass m connected by cords are pulled by a force F on a smooth horizontal surface as shown in figure. Determine the tensions T_1, T_2 and T_3 in the cords. (3)



16. Write an expression for work done in terms of rectangular components of force and displacement. Define S.I. unit of work. (3)

OR

A car of mass 1000 kg accelerates uniformly from rest to

(ii) its gain in kinetic energy

(iii) average power of the engine during this period. Neglect friction.

17. The voltage across a lamp is $V = (6.0 \pm 0.1)$ volt and the current passing through it $I = (4.0 \pm 0.2)$ ampere. Find the power consumed by the electric lamp. (3)

18. What are concurrent forces? Obtain the condition for the equilibrium of three concurrent forces. (3)

19. (a) Define relative velocity of one object with respect to another object.

(b) Two parallel rail tracks run north – south. Train A moves north with a speed of 54 kmh^{-1} and train B moves south with a speed of 90 kmh^{-1}. What is the

(i) relative velocity of ground with respect to B?

(ii) velocity of a monkey running on the roof of the train A, against its motion (with a velocity of 18 kmh^{-1} with respect to the train A) as observed by a man standing on the ground? (3)

20. Define kinetic energy. Derive an expression for the kinetic energy of a body of mass m moving with a velocity V. (3)

21. Find the value of 60 J per min on a system that has 100g, 100cm and 1min as the base units. (3)

22. (a) Define angle of friction. Deduce its relation with coefficient of limiting friction.

(b) A block slides down at an angle 30^0 with an acceleration g/4. Find the coefficient of kinetic friction. (3)

SECTION – D

23. Mohan drive a car at a speed of 70 km/h along a straight road for 8.4 km. Then the car suddenly ran out of petrol. Mohan did not lose his cool. Instead, he walked for 30 min to reach a petrol pump at a distance of 2 km. (4)

a. What were the values displayed by Mohan?

b. What was the average velocity from the beginning of his drive till he reached the petrol pump?

24. What is the need for banking of road? Obtain an expression for the maximum speed with which a vehicle can safety negotiate a curved road banked at an angle □. The coefficient of friction between the wheel and the road is μ. Hence write expression for optimum speed. (5)

OR

What is rolling friction? Write an expression for the coefficient of rolling friction. Give two advantages of friction.

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b. A 30 kg shell is flying at 48 ms^{-1}. When it explodes, its one part of 18 kg stop, while the remaining part flies on. Find the velocity of the later.

25. State parallelogram law of vector addition. Find analytically the magnitude and direction of the resultant of two vectors inclined at an angle □. (5)

OR

a. A projectile is fired with a velocity u making an angle □ with the horizontal. Show that its trajectory is a parabola.

b. Find the angle of projection for which the horizontal range and the maximum height of a projectile are equal.

26. State the law of conservation of mechanical energy. Show that the total mechanical energy of body falling freely under gravity is conserved. Show it graphically. (5)

OR

Show that in case of one – dimensional elastic collision of two bodies, the relative velocity of separation after the collision is equal to the relative velocity of approach before the collision. Calculate the velocities of the bodies after the collision. Discuss special cases also.

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