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SURAJ BHAN D A V PUBLIC SCHOOL
1st Terminal Examination 2015
CLASS XI

Time 3 hrs   **PHYSICS**   **MM 70**

Instructions :

1. *All questions are compulsory. There are 26 questions in all*

2. *The question paper has five sections*

3. *Section A contains five questions of one marks each,*
   Section B contains five questions of two marks each,
   Section C contains twelve questions of three marks each,
   Section D contains one question of four marks each,
   Section E contain three questions of five marks each,.

SECTION - A

Q1. Distance Z travelled by a particle is defined by $Z = \alpha + \beta t + \gamma t^2$. Write the dimension of γ

Q2. Two bodies A and B weighing 5 kg and 10 kg respectively have equal momentum. Which one has more kenetic energy. (Give the ratio of their kenetic energies).

Q3. The area of parallelogram drawn with $\vec{A}$ and $\vec{B}$ as its adjacent sides is ½AB, what will be the angle between $\vec{A}$ and $\vec{B}$.

Q4. Write down the relation between absolute unit and gravitational unite of force in SI and C.G.S system of unit.

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Q5. What is the angle between the direction of velocity and acceleration at the highest point of the projectile.

Section B

Q6 Derive Newton's third law of motion from the law of conservation of momentum.

Q7 The sum and difference of two vectors are perpendicular to each other. Prove that the vectors are equal in magnitude.

Q8 A force of given value $\vec{F} = \hat{i} + 5\hat{j} + 7\hat{k}$ act on a particle and displaces it through $\vec{S} = 6\hat{i} + 9\hat{k}$. Calculate the work done if the force is in newton and displacement in metre.

Q9 If the errors involved in the measurement of side and mass of a cube are 2% and 4% respectively. What is the maximum permissible error in the density of material.

Q10 Prove that a vector can be resolved along two given direction in one and only one way.

Section C

Q11. a) If $\hat{i}$ and $\hat{j}$ are unit vectors along x and y axis respectively then what is the magnitude and direction of $\hat{i} + \hat{j}$ and $\hat{i} - \hat{j}$.

b) Find the component of $\vec{a} = 2\hat{i} + 3\hat{j}$ along the direction of vector $\hat{i} + \hat{j}$ and $\hat{i} - \hat{j}$.

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Q12. Derive an expression for the potential energy of an elastic stretched spring.

Q13. A pendulum bob of mass 10 gms is raised to a height of 5×10^{-2} m and then released. At the bottom of swing it picks up a mass of 10^{-3} kg. To what height will the combined mass rise? Take g=10m/s^2

Q14 A particle of mass 0.5kg travels in a straight line with velocity $v = ax^{3/2}$. where a $= 5m^{-1/2}s^{-1}$. What is the work done by the net force during its displacement from x=0 to x=2m?

Q15 Find a unit vector perpendicular to the vectors $\vec{A} = 4\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{B} = 2\hat{i} + \hat{j} - 2\hat{k}$.

Q16 The co-ordinates of moving particles are x=at^2 y=bt^2 where a and b are constant. Calculate the velocity of particle at any moment.

Q17 Derive the relation for time period of satellite revolving around the planet, with the help of demensional analysis show that time period depends upon density of planet and grairtational constant.

Q18 When a horse pulls a cart, according to Newton's third law, the cart also pulls the horse with an equal and opposite force. What causes the motion of horse, cart and the system as a whole? Explain with the help of diagram.

Q19 Two masses M and m are connected at the end of an inextensible string. The string passes over a smooth frictionless pulley. Calculate the acceteration of the masses and tension in the string. (M>m)

Q20 Derive the relation for centripetal acceleration. With the help of diagram show its direction and the velocity of object at a point.

3
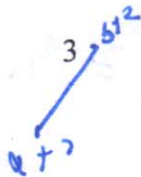
Q21 State parallelogram of vector addition. Derive the relation for resultant vector using parallelorgram of vector addition

Q22 a) State work energy theorem.
b) What are conservative forces give two examples.

Section D

Q23 a) Give two important characteristics of elastic collision.

b) A 10 Kg ball and 20 kg ball approach each other with velocities 20m/s and 10m/s respectively, What are their velocities after collision if the collision is perfectly elastic?

Section E

Q24 Obtain an expression for the maximum speed with which a vehicle can safely negotiate a curved road banked at an angle θ. The coefficent of friction between the wheels and the road is μ.

Q25 Derive the relation for final position of the body, if a body is moving with uniform acceleration 'a' and had initial velocity 'μ' at time 't$_1$ and final velocity v at time t$_2$

Q26 a) State laws of friction. Draw the graph between applied force and frictional force.

b) The minimum force required to move a body up in inclined plane is three times the minimum force required to prevent it from sliding down the plane. Calculate the angle of inclined plane, if the coefficient of friction between the body and the inclined plane is $\frac{1}{2\sqrt{3}}$.

or

$$M_1 V_1 + M_2 v_2 = M_1 V_1 + M_2 v_2$$

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a) Give important characteristics of a projectile. If projectile is fired with a velocity 'u' making an angle θ. With the horizontal show that its trajectory is a parabola. Derive expresion for its horizontal range.

b) When the angle of projection is 75°. a ball falls 10m short of the target. When the angle of projection is 45°, it falls 10m ahead of the target. Both are projected from same speed and from same point, what is the distance of target from the point of projecftion.

$$\frac{u^2 \sin 2\theta}{g}$$

or

$$\frac{u^2}{g} 2 \sin\theta \cos\theta$$

$$\frac{u^2}{g} 2 \sin\theta \cos\theta$$