Half Yearly Examination - 2018-19

PHYSICS

Class : XI

Time : 3 Hrs. + 15 min **Full Marks : 100**

PART I

Q1. a) Choose the correct alternatives

(i) If the velocity of light ©,gravitational constant (G) & plank's constant (h) chosen as fundamental quantities than the dimension of the mass in this system is:

(a) hCG (b) hCG^{-1} (c) $h^{-1}C^{-1}G$

(d) h½ C½ $G^{-½}$

(ii) A rifle bullet loses 1/20th of its velocity is passing through a plank. The least Number of such plank just to stop the bullet is:

(a) 5 (b) 10 (c) 12J (d) 16J

(iii) An object of mass 2 kg is moving its distance varies with time as $S=T^3/3$ where S=distance in 'm' & 'T'=time in sec. The work done in first two seconds is :

(a) 4J (b) 8J (c) 12J (d) 16J

(iv) A car is moving with a speed of 10ms -1 on a circular track. If the coeffcient of friction is 0.5 then the radius of turning of the car will be ($g=10m/s^2$):

(a) 20m (b) 10m (iii) 5m (iv) 2m

(v) A simple pendulum has a time period T_1 & T_2 at height R above the earth surface where R is the radius of the earth. The value of T_2/T_1 is:

(a) √1 (b) √2 (c) 4 (d) 2

(B) Answer the following questions. Your answer should be brief and to the point. (1x7)

(a) The displacement of particle is one dimensional motion given by $x=t^3-6t^2+3t+4$ in meter what will be the velocity of the particle when its acceleration is zero.

(b) Find the dimension of the constant a & b in the relation $E=b-x^2/at$ where E=energy, x=distance & t= time.

(c) The second hand of a watch is 2 cm long, calculate the change of Velocity of the tip of the needle in quarter rotation.

(d) A body is moving in a circular track of radius 2m with an acceleration $2m/s^2$, if the Instantaneous speed is 2m/s, then what is its absolute acceleration.

(e) Time displacement graph for two objects A & B are drawn on the same scale.

These are straight lines which make 30^O & 60^O respectively with the time axis which one has a greater velocity .What is the ratio of their velocities.

(f) Moon travelers tie heavy weight at their back why?

(g) If the radius of the earth becomes one third of present value then what will be the duration of the day (mass is constant).

SECTION B

Answer the following questions

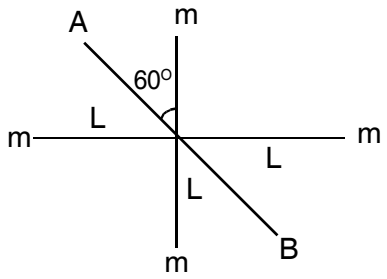
Q2. How does doubling the speed of car affect the stopping distance for the same breaking force? (2)

b) Three particles each of mass 'm' kept at three corners of equilateral triangle of side 'L'. All these start moving with equal velocity 'v' along median so that colliding at the center. First one stops second one retraces back with same velocity. What is the velocity & its direction of motion for the third. (2)

Q19. What is newtons experimental law for collision? Find the expression for velocity of separation after one dimensional elastic collision. (5)

Q20 a) State & prove parallel axes theorem. (5)

b) There are four point masses each of 'm' kept at a distance 'L' from origin as shown in figure find the moment of intertia of the system about axis AB.



Q21. a) Discuss the variation of 'g' due to rotation of earth. (3)

b) A chain of mass 'm' is kept over a smooth table with one third of its length over the table. If it is released from this position then find the K.E. of the chain when the last end of the chain is just about to slip off the table. The length of the chain is 'L'. (2)

OR

a) Derive the equation for height of a parking orbit from the earth surface. (3)

b) If the radius of earth shrinks by 4%. What is the percentage change in the value of 'g'. (2)

Q3. A solid sphere is rolling over an inclined plane of inclination 30^{O}. Find the acceleration associated with it. (2)

Q4. An object moving along with speed of $6.25 m/s^{-1}$ is decelerated at the rate of $dv/dt=2.5 \sqrt{v}$ where v is the instantaneous speed. What is the time taken by the object to come at rest? (2)

Q5. A soda water bottle is falling freely. Will the bubble of the gas rise in the water of the bottles. Explain. (2)

Q6. A particle of mass m moving with velocity 'v' towards east strikes another particle of same mass moving with the same velocity towards north. After striking the two particles stick together. What is the velocity & direction of the motion of the system? (2)

Q7. A body mass 10 kg moving with a speed of 2m/s on a frictionless table strikes a mounted spring & comes to rest. If the spring constant of the spring is $4x10^{5}$ nm^{-1} than find the compression in the spring. (2)

Q8. What do you mean by the coefficient of restitution. Explain its value for the perfectly elastic and inelastic collision. (2)

Q9. If $t= \sqrt{x+7}$ where x = displacement and t=time. Find the instantaneous velocity at t=1 sec. After what time it will come to rest. (2)

Q10. The length and the breadth of rectangular sheet are measured to be 5.7 and 3.4 cm respectively by scale with L.C. 0.1cm. Find the percentage error in the calculation of the area of the sheet. (2)

Q11. Why is it important to extend the time of collision to minimize injury in crash? (2)

SECTION C

Q12. A bob of mass 'M' hung from ceiling with a string of length 'l' the speed of the bob at mean position is 'v'. What will be the trajectory of the bob if the string is cut when the bob is (a) at one of its extreme position (b) at its mean position. (3)

Q13. A body slides down from rest from the top of a 6.4m long rough plane inclined at 30^{O} with the horizontal. Find the time taken by the block in reaching the bottom of the plane.(Take $\mu_k = 0.2$ & $= 9.8 m/s^2$) (3)

Q14. A train starting from rest moving with uniform acceleration 'a' for some time and then retards uniformly with 'b' to come to rest. If total time of journey is 't' then find the maximum velocity achieved by it & also the total distance covered in the process. (3)

Q15. Prove vectorially in a Δ $\text{Cos A} = b^2 + c^2 - a^2 / 2bc$, where the terms have their usual meaning (3)

Q16. What is centripetal force? Derive an expression for the centripetal force (3)

Q17. What is gravitational potential? Find the expression for gravitational potential due to point mass. (3)

OR

(b) What is escape velocity? Find its expression.

SECTION D

Q18. a) Three point masses each of 2 kg is kept at the vertex of an equilateral triangle of side of length 50cm. Calculate the potential energy of the system. (3)

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