FIRST TERM EXAMINATION (28 SEPT 2015)

Paper - PHYSICS

Class – XI

(SET – A)

Time: 3hrs. **MM: 70**

Instructions:

1. ***All questions are compulsory.***
2. ***Q.no.1 to 5 carry 1 mark each.***
3. ***Q. no. 6 to 10 carry 2 marks each.***
4. ***Q. no. 11 to 22 carry 3 marks each.***
5. ***Q. no. 23 is one value based question.***
6. ***Q no. 24 to 26 carry 5 marks each.***
7. ***Use of calculator is not allowed.***

Q1. Define 1 light year and write its value. (1)

Q2. Plot speed time graph for a ball projected upwards and come back to some position after some time. (1)

Q3. Prove that the vectors $\vec{A} = \hat{i} + \hat{j} + 3\hat{k}$ is perpendicular to $\vec{B} = 2\hat{i} - \hat{j}$ (1)

Q4. A large size brake on bicycle is as effective as small one. Comment. (1)

Q5. A body is initially at ret. It undergoes one-dimensional motion with constant acceleration. The power deliver to it at time t is proportional to

(i) $t^{1/2}$ (ii) t (iii) $t^{3/2}$ (iv) t^2 (1)

Q6. Explain the method of measuring the size of oleic acid molecule. (2)

Q7. A car 'A' is moving with a speed of 60km/h and car 'B' is moving with a speed of 75km/h along parallel straight paths, starting from the some point. What is the position of car A w.r.t. B after 20 minutes. (2)

Q8. Show that there are two values of time for which a projectile is at same height. Also show that the sum of these two times is equal to the time of flight. (2)

Q9. A car of mass 1000kg travelling at 32m/s dashes into the rare of a truck of mass 8000 kg moving in the same direction with a velocity Of 4m/s. After the collision, the car bounces with a velocity of 8m/s. What is the velocity of truck after the impact. (2)

Q10. Prove that the Gravitational force is a conservative force.

OR

Find tension and acceleration from the fig.

Q11. a) Can a body have energy without momentum? (1)

b) A bullet of mass 0.012kg and horizontal speed 70m/s strikes a block of wood of mass 0.4kg and instantly come to rest with respect to the block. The block is suspended from the ceiling by means of thin wires. Calculate the height to which the block rises. Also estimate the amount of heat produced in the block. (2)

Q12. Briefly explain how is a vehicle able to go round a level curved track. Determine the maximum speed with which the vehicle can negotiate this curved track safety. (3)

Q13. A boatman can row with a speed for 10km/h in still water. If the river flows steadily at 5km/h in which direction should the boatman row in order to reach a point on the other bank directly opposite to the point from where he started? The width of the river is 2km. (3)

Q14. Derive the expression of relative velocity in one-dimension. (3)

Q15. Obtain by the method of dimensional analysis on expression for surface tension (S) of a liquid rising in a capillary tube. Assume that the surface tension depends upon (i) mass 'm' of the liquid (ii) pressure (P) of the liquid (iii) radius 'r' of the capillary tube. The constant of proportionality, K=1/2.

Q16. A juggler maintains four balls in motion making each in turn rise to a height of 20m from his hand. With what velocity does he project them & where will the other three balls be at the instant when the fourth one is just leaving the hand. (3)

Q17. Derive an expression for equation of trajectory time of flight and horizontal range for a projectile fired at an angle $'\alpha'$ with horizontal.

Q18.a) Derive an expression for acceleration of a body moving up a rough inclined plane on angle $'\theta'$

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

Q19. Prove that there is always some loss of energy during perfectly inelastic collision in one dimension. (3)

Q20. Two resistors of resistances $R_1 = (4 \pm 0.5)\ \Omega$ and $R_2 = (16 \pm 0.5)\ \Omega$ are connected (i) in series and (ii) in parallel; find the equivalent resistance in each case with limits of percentage error.(3)

OR

For the estimation of Young's modulus. $Y = \frac{4}{\pi}\ \frac{Mg}{d^2}\ \frac{L}{l}$ for specimen of a wire following observations were recorded; L= 2.890, M=3, d= 0.082 g=9.81, l=0.087 calculate the maximum percentage error in the value of Y and mention which physical quantity causes maximum error. $\Delta M = 0.01$, $\Delta L = 0.001$, $\Delta d = 0.001$, $\Delta l = 0.001$, (3)

Q21. Prove the relation for uniform circular motion

$v = r\,w$ $w = angular\ velocity$

$v = linear\ \ speed$ (3)

$r = radius\ of\ circular\ \ path$

Q22. A body is projected with velocity of 40m/s. After 2 sec it crosses a vertical pole of height 20.4m. Calculate the angle of projection and horizontal range. (3)

Q23. Rakesh with the intention to win in the inter school sports practiced high jump every day for about a month. He participated and won first position in the inter school sports.

i) Comment upon the values Rakesh possesses.
ii) Why does an athlete run some steps before taking a jump?

Q24a) If R is the horizontal range for inclination and h is the maximum height reached by the projectile show that the maximum range is given by $\frac{R^2}{8h} + 2h$.

b) What is the angle of projection for a projectile motion whose range R is n times the maximum height H?

OR

a) Prove the equation $v^2 - u^2 = 2as$ by integration method. (2)
b) State and prove parallelogram law of vector addition. (2)
c) Draw a $x - t$ graph representing motion of an object under free fall. Neglect air resistance.(1)

Q25. Explain dynamics of vertical circular motion and find the expression of velocity at the lowest and highest point, also find the condition of body to leave the circle.

OR

a) A ladder 4m long (of mass 25kg) rests with its upper end against a smooth wall and lower end on rough ground. What must be the least coefficient of friction between the ground and the ladder for it to be inclined at 60^0 with the horizontal without slipping? Take $g = 10 m/s^2$

Q26. Explain Elastic Collision in one dimension and hence find the expression of velocity after collision.

OR

a) A locomotive of mass m starts moving so that its velocity varies according to the law: $v = k\sqrt{s}$; where k is a constant and s is the distance covered. Find the total work done by all the forces which are acting on the locomotive during the first t seconds after the beginning of motion.

b) A small disc A slides down with zero initial velocity from the top of a smooth hill of height H having a horizontal portion as shown in diagram. What must be the height of the horizontal portion h to ensure the maximum distance S covered by the disc?