FIRST TERM EXAMINATION (28 SEPT 2015)

Paper - PHYSICS

Class – XI

(SET – B)

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 Astronomical Unit & Write its value also. (1)

Q2. Plot a graph between speed and time for a ball dropped on the ground from certain height and rebounce back to same height. (1)

Q3. Find the angle between the vectors $\vec{A} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{B} = -\hat{i} + \hat{j} - 2\hat{j}$ (1)

Q4. Why is it difficult to put a cycle in motion than to maintain its motion. (1)

Q5. A body is moving undirectionally under the influence of a source of constant power. Its displacement in time 't' is proportional to

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

Q6. Explain Parallax method of measuring distance of a nearest star from the surface of earth. (2)

Q7. Two trains A and B each of length 100m, are running on parallel tracks. One overtakes the other in 20S and one crosses the other in 10S. Calculate the velocities of each train. (2)

Q8. Show that a given object will shoot three times as high when elevated at an angle of 60^0 as when fired at angle of 30^0 but will carry the same distance on the horizontal plane. (2)

Q9. A bomb at rest explodes into three fragments of equal masses. Two fragments fly off at right angles to each other with velocities 9m/s and 12m/s respectively. Calculate the speed of the third fragment. (2)

Q10. Find acceleration & Tension from the figure.

OR

Prove conservation of Mechanical energy in a freely falling body. (2)

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

b) The bob of a pendulum is released from a horizontal position A as shown in figure. If the length of the pendulum is 1.5m what is the speed with which the bob arrives at the lowermost point B given that it dissipates 5% of its initial energy against air resistance? (2)

Q12. Why does a cyclist lean inwards when moving along a curved path? Determine the angle through which a cyclist bends from the vertical while negotiating a curve. (3)

Q13. A river 800m wide flows at the rate of 5km/h. A swimmer who can swim at 10km/h in still water, wishes to cross the river straight (3)

i) Along what direction must he strike?
ii) What should be his resultant velocity?
iii) How much time he would take?

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

Q15. A large fluid star oscillates in shape under the influence of its own gravitational field using dimensional analysis, find the expression for period of oscillation (T) in terms of radius of star (R) mean density fluid (ρ) and universal gravitation on constant G. (3)

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. (3)

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. $\Delta M = 0.01,\quad \Delta L = 0.001,\quad \Delta d = 0.001,\quad \Delta l = 0.001,$ (3)

Q21. Derive the expression for velocity at any instant of time for case of Rocket Propulsion and also find the thrust acting on Rocket. (3)

Q22. A person observes a bird on a tree 39.6m high and at a distance of 59.2m with what velocity the person should throw an arrow at an angle of 45^0 so that it may hit the bird. (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? (4)

Q24. 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. (5)

OR

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 with out slipping? Take $g = 10 m/s^2$

Q25a) Prove the equation $v^2 - u^2 = 2as$ by integration method.

b) State and prove parallelogram law of vector addition.

c) Draw a $x - t$ graph representing motion of an object under free fall. Neglect air resistance.(1)

OR

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

b) Show that motion of one projectile as seen from another projectile will be a straight line.(3)

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?