No. of Printed Pages : 7   Roll No.....................

FAS / Physics / XI / Semester-1 / 2016-2017

Time : 3 hrs.]   **[M. M. : 80**

General Instructions :–

  (a) All questions are compulsory.

  (b) There are 30 questions in total.

       Questions 1 lo 5 carry one mark each.

       Questions 6 lo 10 carry two marks each.

       Questions 11 to 22 carry three marks each and

       Questions 23 carries 4 marks and

       Questions 24-26 carry five marks each.

  (c) There is no overall choice. However, an Internal choice has been provided in a question of 2 marks, a question of 3 marks all three questions of five marks. You have lo attempt only one of the given choices in such questions.

  (d) Use of calculators is not permitted.

1   Why is the parallax method not suitable for measuring distances of stars more than 100 light years away ?   1

2   A soda water bottle is falling freely, will the bubbles of the gas rise in the water of the bottle ?   1

3   What is the difference between the measurements 4.0 cm and 4.000 cm ?   1

4   The earth moving around the Sun in a circular orbit is acted upon by a force, what is the work done on the Earth by the force ?   1

F–265   **(P.T.O.)**

5 Which is greater – the attraction of earth for 1 kg of iron or attraction of 1 kg for the earth ? Give reason. 1

6 A train moves with a speed of 30 km/h in the first 15 minutes, with another speed of 40 km/h in the next 15 minutes and then with a speed of 60 km/h in the last 30 minutes. Calculate the average speed for the entire journey. 2

7 Find the value of λ in the unit vector 0.4 i+ 0.8 j+ λk. 2

8 Draw a graph between frictional force and applied force on any object and show static friction, limiting friction and kinetic friction in the graph. 2

9 Two trains A and B each of length 100 m are running on parallel tracks. One overtakes the other in 20 s and one crosses the other in 10 s. Calculate the velocity of each train. 2

OR

Read each statement below carefully and state with reasons and examples if it is true or false. A particle in one dimensional motion.

(a) With zero speed at an instant may have non zero acceleration at that instant.

(b) With zero speed may have non zero velocity. 2

10 Rain is falli ng vertically with a speed of 35 m/s. A woman rides a bicycle with a speed of 12 m/s in east to west direction. What is the direction in which she should hold her umbrella ? 2

11 A book with many printing errors contains four different formulas

lor the displacement y of a particle undergoing a certain periodic motion :–

(a) $y = a \sin 2\pi\, t/T$

(b) $y = a \sin vt$

(c) $y = (a/T) \sin t/a$

Where a is maximum displacement of the particle, v is the speed of the particle and T is the lime period Rule out the wrong formula on dimensional grounds. 3

12 Draw the following graphs representing the motion of an object under free fall. Neglect air resistance :–

(i) variation of position with respect to time,

(ii) variation of velocity with respect to time.

(iii) variation of acceleration with respect to time. 3

13 Two vectors A and B are inclined to each other at an angle θ. Using parallelogram law of vector addition, find the magnitude and direction of their resultant. 3

14 A man weighs 70 kg. He stands on a weighing machine in a lift which is moving :–

(i) upwards with a uniform speed of 10 m/s.

(ii) downwards with a uniform acceleration of 5 m/s².

(iii) upwards with a uniform acceleration of 5 m/s². 3

15 A body covers a distance of 20 m in the 7th second and 24 m in the 9th second. How much distance shall it cover in the 15th second. 3

(P.T.O.)

16.   Discuss the variation of 'g' with depth. What happens to g at the centre of the earth ?   3

17.   Derive an expression for the orbital velocity of an object from the surface of the earth.   3

18. (a)   Derive a relation between linear velocity and angular velocity.

     (b)   What is the angle between velocity vector and acceleration vector in uniform circular motion ?   3

<div align="center">OR</div>

     (a)   What is the angle made by vector A=2i+2j with x axis ?

     (b)   Give an example of zero vector.   2+1

19.   What are Conservative forces? With the help of a suitable illustration show that gravitational force is a conservative force.   3

20. (a)   Draw the graph of the equation F= −kx, where F is the spring force and x is the displacement of the block from equilibrium position.

     (b)   Derive an expression for the potential energy of an elastic stretched spring.   1+2

21. (a)   What is (1) period of revolution and (2) sense of rotation for a geostationary satellite ?

     (b)   Which has the greatest value of escape velocity- Mercury of Jupiter ?

     (c)   A spring balance is suspended inside an artificial satellite revolving around the earth. If a body of mass 1 kg is suspended from it. What would be its reading ?   3×1=3

22 To simulate car accidents, an auto manufacturer study the collision of moving cars with mounted springs of different spring constants. Consider a typical simulation with a car of mass 1000 kg with a speed of 18 km/h on a smooth road and colliding with a horizontally mounted spring constant 6.25×10^3 N/m. What is the maximum compression of the spring ? 3

23 Raju saw his Grandmother trying to clean a carpet. She was feeling difficulty in lifting the carpet. Raju helped his Grandmother in cleaning the carpet by beating it with the stick :–

 (a) What are the values displayed by Raju?

 (b) Name the scientific principle involved in Raju's action.

 (c) Give one such more example. 1+1+2

24 (a) The measured mass and volume of a body are 2.00 g and 5.0 cm³ respectively with possible errors of 0.01 g and 0.1 cm³, what would be the percentage error in density ?

 (b) The period of oscillation of a simple pendulum is $T = 2\pi (l/g)^{1/2}$. Measured value of L is 20.0 cm known to 1 mm accuracy and time for 100 oscillations of the pendulum is found to be 90 s using a stop watch of 1 s resolution. What is the accuracy in the determination of "g" ? 2+3

OR

In successive measurements, the readings of the period of oscillation of a simple pendulum were found to be 2.63 s, 2.56 s, 2.42 s, 2.71 s and 2.80 s in an experiment. Calculate :–

(P.T.O.)

(i) mean value of the period of oscillation

(ii) absolute error in each measurement

(iii) mean absolute error

(iv) percentage error

(v) express the result in proper form. $1×5=5$

25   Define Projectile motion. Show that the path of a projectile is a parabola. Find the angle of projection at which horizontal range and maximum height of the projectile are equal.   5

OR

(a) Show that there are two angles of projection for which the horizontal range is same for a projectile.

(b) The position of a particle is given by $r=3.0i-2.0\ t^2j+4.0k$, where t is in seconds and the coefficients have the proper units for r to be in meters.

(i) Find the expressions for the velocity and acceleration of the particle.

(ii) What is the magnitude of the velocity of the particle at t= 2s ?

$2+3$

26   Prove that in an elastic 1-D collision between two bodies, the relative velocity of approach before collision is equal to the relative velocity of separation after the collision. Hence derive the expression for the velocities of two bodies in terms of their initial velocities before collision. $(1+2+2)$

OR

a) A light body and heavy body have the same momentum, which one will have a greater kinetic energy ?

b) Spring A and B are identical except that A is stiffer than B. In which spring more work is expended if they are stretched by the same amount.

c) A bullet gets embedded into a block of wood, is the collision elastic of inelastic ?

d) What is the work done by the force of tension in the string of a simple pendulum ?

e) A spring is cut into two halves, how is the spring constant of each half affected ? $1×5=5$