AMRITA VIDYALAYAM
FIRST TERMINAL EXAMINATION 2018 -'19

Class : XI   Marks : 70
                                                              Time : 3 hrs

PHYSICS (042)

GENERAL INSTRUCTIONS:
1. All questions are compulsory.
2. There are 27 questions in total. Questions 1 to 5 carry 1 mark each, questions 6 to 12 carry 2 marks each, questions 13 to 24 carry 3 marks each and questions 25 to 27 carry 5 marks each.
3. Question 23 is a value based question carrying 4 marks.
4. There is no overall choice. However, an internal choice has been provided in all 3 questions of 5 marks each. Only one of the choices in such questions has to be attempted.
5. Use of calculators is not permitted.

1. Name the SI unit of temperature and plane angle.
2. Draw the position - time graph for motion with positive acceleration.
3. A vector is multiplied by a scalar. Will its unit change?
4. A force $\vec{F} = \hat{i} + 5\hat{j} + 7\hat{k}$ acts 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.
5. At which place on earth's surface, the value of g is largest and why?
6. State the no. of significant figures for the following.
   a) $0.0007 \ cm^2$ b) $4.328 \times 10^{12} \ kg$ c) $0.2043 \ g/cm^3$
   d) $8.510 \ J$ e) $6.032 \ N/m^2$ f) $0.0006032 \ m^2$
7. The position of an object moving along x - axis is given by $x = p + qt^2$ where $p = 7.5$ m, $q = 3.5 \ m/s^2$ and t is measured in seconds. What is the velocity at $t = 0$ s and $t = 3$ s.
8. State and explain triangle law of vector addition with proper figure.
9. Show that Newton's second law of motion is real law of motion.
10. A light body and a heavy body have the same kinetic energy. Which one will have greater momentum?
11. What are the factors on which momentum depends? Explain with suitable examples.
12. Derive the relation between linear velocity and angular velocity.
13. Assuming that the mass M of the largest stone that can be moved by a flowing river depends upon 'v' the velocity, 'ρ' the density of water and on 'g', the acceleration due to gravity show that M varies with the sixth power of the velocity of flow.
14. Obtain equations of motion for constant acceleration using method of calculus.
15. A particle starts from origin at $t = 0$ with a velocity $5.0\hat{i}$ m/s and moves in x-y plane under action of force which produces a constant acceleration of $(3.0\hat{i} + 2.0\hat{j}) \ m/s^2$.
    a) What is the y-coordinate of the particle at the instant its x-coordinate is 84 m?
    b) What is the speed of the particle at this time?
16. Explain the laws of kinetic friction and define the coefficient of kinetic friction.
17. When a stone is dropped from the top of a building what types of energy transformations take place? Does it violate law of conservation of energy? Explain.
18. Check the correctness (consistency) of the following equations.
    a) $S = ut + \frac{1}{2}at^2$ b) $v^2 = u^2 + 2as$ c) $v = u + at$

19.   The velocity time graph of an object moving along a straight line is as shown.

Calculate distance covered by object between
a) $t = 0$ to $t = 5$ sec   b) $t = 0$ to $t = 10$ sec
20.   Find the magnitude and direction of the resultant of two vectors $\vec{A}$ and $\vec{B}$ in terms of their magnitude and angle θ between them?
21.   Why does a cyclist lean inward when moving along a curved path? Determine the angle through which a cyclist bends from the vertical while negotiating a curve.
22.   Draw a plot of spring force versions displacement x. Hence find an expression for the potential energy of an elastic stretched spring.
23.   a) The resistance $R = $ where $V = (100 \pm 5)$ V and $I = (10 \pm 0.2)$A. Find the percentage error in
         R.   I
       b) A physical quantity P is related to four observables a, b, c and d as follows.
           $P = \dfrac{a^3 b^2}{\sqrt{c}\, d}$

       The percentage errors of measurement in a,b,c and d are 1%, 3%, 4% and 2% respectively. What is the percentage error in quantity P?
24.   Does the position time graph of two objects with equal velocities cross each other? Justify your answer by deriving the equation for relative velocity.
25.   In an experiment to measure focal length of a concave mirror, the value of focal length in successive observations turns out to be 17.3 cm, 17.8 cm, 18.3 cm, 18.2 cm, 17.9 cm and 18.0 cm. Calculate the mean absolute error and percentage error. Express the result in proper way.
                              OR
       The length of road as mentioned in an experiment was found to be 2.63 m, 2.42 m, 2.71 m and 2.80 m. Find the absolute error in each observation and the percentage error.
26.   What do you mean by projectile? Derive the expressions for
       a) time of flight (T).   b) maximum height (H).   c) horizontal range (R).
                              OR
       a) Prove that the path of projectile is parabolic.
       b) Prove that the maximum horizontal range is 4 times the maximum height attained by the projectile, when fired at an inclination so as to have maximum horizontal range.
27.   Discuss the variation of acceleration due to gravity 'g' with depth and altitude.
                              OR
       Derive the expression for gravitational potential energy.