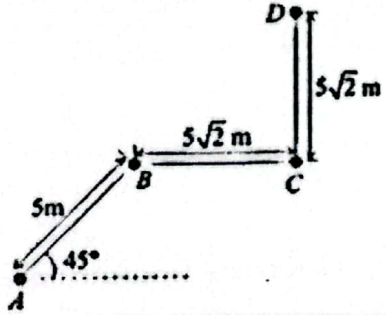
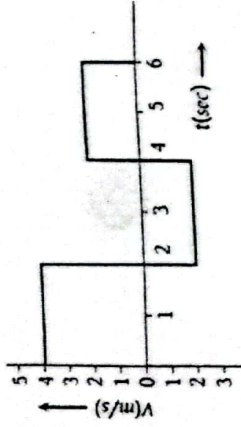


General Instructions:

Read the following instructions very carefully and strictly follow them :

- This question paper comprises four Sections - A, B, C and D.
- There are 12 questions in the question paper on 2 printed pages.
- All questions are compulsory.
- Section A – Questions no. 1 to 4 are very short answer type questions carrying one mark each.
- Section B – Questions no. 5 to 8 are carrying two marks each.
- Section C – Questions no. 9 to 11 carrying three marks each.
- Section D – Questions no. 12 is case based type question, carrying four marks each.
- There is no overall choice.
- Use of calculators is NOT allowed.
- Show working steps and give reasons accordingly wherever required. It carries marks.

SECTION-A		
1.	State any TWO limitations of dimensional analysis.	1
2.	<p>A particle moves along a path ABCD as shown in the figure below. Calculate the magnitude of displacement of the particle from A to D.</p> 	1
3.	A car moves from X to Y with a speed v_u and Y to X with a speed v_d . Calculate the average speed for this round trip in terms of v_u and v_d	1
4.	State why SI System is a rational system of units with an example.	1
SECTION-B		
5.	Write the dimensional formula of a/b in the relation $P = (a - t^2)/bx$, where P is the pressure, x is the distance and t is the time.	2
6.	Convert 1 Newton into dyne using the method of dimensions.	2
7.	The velocity-time graph of a body moving along a straight line is shown in the figure. Find the displacement and distance travelled by the body in 6 seconds.	2



8. A stone is thrown vertically upward. When particle is at a height half of its maximum height, then its speed is 10 m/s. Find the maximum height attained by the particle. (Take $g = 10 \text{ m/s}^2$)

SECTION-C

9. A gas bubble, from an explosion under water oscillates with a period T proportional to $P^a d^b E^c$, where P is the pressure, d is the density of water and E is the total energy of the explosion. Find the values of a , b and c . 3
10. Two cars are travelling towards each other on a straight road at velocities 15 m/s and 16 m/s respectively. When they are 150 m apart, both the drivers apply the brakes, and the cars decelerate at 3 m/s^2 and 4 m/s^2 until they stop. Calculate the separation between the cars when both come to rest. 3
11. A car accelerates from rest at a constant rate of α for some time; after which it decelerates at constant rate of β to come to rest. If the total time elapsed is T second.
 (i) Draw a velocity-time graph for the motion.
 (ii) Calculate maximum velocity attained in terms of α , β and T .
 (iii) Calculate the total distance travelled in terms of α , β and T . 3

SECTION-D

12. The Van Der Waals equation is given by $(P + a/V^2)(V - b) = RT$.
 Where P = pressure, V = volume, T is the temperature of a given sample of gas. R is called universal gas constant, a and b are called Van Der Waals constants. 4
- (i) The dimensional formula for b is same as that of
 (a) P (b) V (c) PV^2 (d) RT
- (ii) The dimensional formula for a is same as that of
 (a) V^2 (b) P (c) PV^2 (d) RT
- (iii) Which of the following does NOT possess the same dimensional formula as that of RT ?
 (a) PV (b) Pb (c) a/V^2 (d) ab/V^2
- (iv) The dimensional formula for ab/RT is
 (a) ML^5T^{-2} (b) $M^0L^3T^0$ (c) $ML^{-1}T^{-2}$ (d) $M^0L^6T^0$