MOTION IN A PLANE

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General Instructions: Answer all the questions. If you are unable to answer any question, go through the page number that is given against that particular question in the text book. You can find the answer**.**
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<div align="center">Test Paper-II</div>

MAX MARKS: 30   **TIME: 90Mts**

1   A motorboat is racing towards north at 25 km/h and the water current in that region is 60⁰ east of south. Find the resultant velocity of the boat.   P72   3

2   A position vector r of a particle located in a plane with reference to the origin of an   P73   x-y reference frame is given by r=$x\hat{\imath} + y\hat{\jmath}$ What do you understand by x and y   2   values. Also show the vector representation diagrammatically.

3   Define velocity of an object .Give the formula (in terms of vector) to find the   P73   velocity. Also give the vector diagram showing how you will determine the velocity   3   using vector diagram.

4   Define average acceleration of an object in terms of vectors. Also give the vector   P73   diagram representing the same.   2

5   Explain briefly how you will determine the acceleration of an object using vector   P75   diagrams. Also state what difference that you will find in determining the velocity   3   and acceleration of motion of an object in two or three dimensions.

6   The position of a particle is given by r =$3.0t\hat{\imath} + 2.0t^2\,\hat{\jmath} + 5.0\hat{k}$ where t is in   P75   seconds and the coefficients have the proper units for 'r 'to be in meters. (a) Find   3   v (t) and a (t) of the particle.(b) Find the magnitude and direction of v(t) at t=1.0s.

7   Derive the equations for finding the motion of an object moving with constant   P76   acceleration in a Plane. Also what conclusions can you draw from the equations?   3

8   A particle starts from origin at t=0 with a velocity $5.0\hat{\imath}$ m/s and moves in x-y plane   under action of a force which produces a constant acceleration of   P76   3 $(3.0\hat{\imath} + 2.o\hat{\jmath}$) m/s². (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?

9   Give an expression for finding the relative velocity in two dimensions.   P76   1

10   Rain is falling vertically with a speed of 35ms^{-1}. A woman rides a bicycle with a speed of 12 m s^{-1}in east to west direction. What is the direction in which she should hold her umbrella?   P76   2

11   What is a projectile? Derive the equation of path of a projectile.   P77   3

12   Galileo, in his book Two new sciences, stated that "for elevations which exceed or fall short of 45° by equal amounts, the ranges are equal". Prove this statement.   P78   2