St. Lawrence High School

A Jesuit Christian Minority Institution

Term : 1st

Work Sheet – 11

Class – XI   Subject – Physics   Date – 26.06.20

Chapter – Vector   Topic –River – Man problem
                                                                           & DOT product

Choose the correct option for the following questions. $1 \times 15 = 15$

1. Choose the incorrect option –

    For any two non zero constant vectors $\vec{A}$ *and* $\vec{B}$ -
    a. $\vec{A}.\vec{B} = \vec{B}.\vec{A}$
    b. $\vec{A}.\vec{A} = A^2$, where $|\vec{A}| = A$
    c. $\vec{A}.\hat{\imath} = \vec{A}.\hat{\jmath}$ always
    d. $\vec{A}.-\vec{A} = -A^2$

2. If $\vec{P} = 3\hat{\jmath} - \hat{\imath}$ and $\vec{Q} = 2\hat{\jmath} - \hat{k}$, then $\vec{P}.\vec{Q} =$
    a. 7
    b. 6
    c. – 6
    d. 0

3. The dot product of position vectors of points (3, -2) and (2, -3) is –
    a. 0
    b. 12
    c. -12
    d. None of these

4. A force $3\hat{\imath} + 4\hat{\jmath}$ N acts on a body and displaces it by $3\hat{\imath} + 4\hat{\jmath}$ m. The work done by the force is –
    a. 5J
    b. 25J
    c. 10J
    d. 30J

5. If the $\vec{P} = a\hat{\imath} + a\hat{\jmath} + 3\hat{k}$ and $\vec{Q} = a\hat{\imath} - 2\hat{\jmath} - \hat{k}$ are perpendicular to each other, then the positive value of a is –
    a. 0
    b. 1
    c. 2
    d. 3

6. The angle between two vectors $\vec{A} = 3\hat{\imath} + 4\hat{\jmath} + 5\hat{k}$ and $\vec{B} = 3\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ is –
    a. 60°
    b. 0°
    c. 90°
    d. *none of these*

7. The angle between $\hat{i} + \hat{j}$ and $\hat{i} - \hat{k}$ is –
   a. 60°
   b. 30°
   c. 45°
   d. 90°

8. If $\vec{a}_1$ and $\vec{a}_2$ are two no linear unit vectors, and $|\vec{a}_1 + \vec{a}_2| = \sqrt{3}$, then $(\vec{a}_1 - \vec{a}_2).(2\vec{a}_1 + \vec{a}_2) =$
   a. 2
   b. 3/2
   c. ½
   d. 1

9. The speed of a person in still water is $20\ km/h$. If he wants to cross a river to reach the exactly opposite point on the other bank of the river, then at what angle he should project himself w.r.t the bank of the river? Speed of the river current is $10\sqrt{3}\ km/h$.
   a. 30°
   b. 45°
   c. 60°
   d. 90°

10. In the above problem, if the width of the river is 12km, then what will be the time taken by him to cross the river in shortest path?
    a. 1.2min
    b. 36min
    c. 48min
    d. 72min

11. In above case, what will be the shortest time taken to cross the river?
    a. 36min
    b. 48min
    c. 72min
    a. None of these

12. If he crosses the river in shortest time, then what distance he has to walk along the bank of the river to reach the opposite point as of starting point? What will be the angular shift related to this?
    a. $3\sqrt{3}$ km , $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$
    b. $6\sqrt{3}$ km, $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$
    c. $3\sqrt{6}$ km , $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$
    d. $6\sqrt{6}$ km , $\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$

13. When a man projects himself at an angle 30° with the perpendicular direction of the bank of a river, he can reach the exactly opposite point on the other bank. If his speed in still water is 12km/h, then what is the speed of the river?
    a. 12km/h
    b. $12\sqrt{3}$ km/h
    c. $6\sqrt{3}$ km/h
    d. 6 km/h

14. In the above case, if he projects himself at an angle $60°$ with the perpendicular direction of the bank of a river, then how much distance he has to walk along the bank to reach the opposite point as of the starting point? Width of the river is $12(\sqrt{3} + 1)$ km
    a. 0 km
    b. 12 km
    c. 24 km
    d. $6(\sqrt{3} - 1)$ km

15. In problem no. 12, what is the time taken by the man to cross the river ?
    a. $2(\sqrt{3} + 1)$ hr
    b. $2(\sqrt{3} - 1)$ hr
    c. $\sqrt{3} + 1$ hr
    d. $\sqrt{3} - 1$ hr