VECTORS

Q1. Vectors cannot be added algebraically why?

Q2. Under what conditions the direction of sum and difference of two vectors will be the same?

Q3. what is the angle between $(\vec{A} + \vec{B})$ and $(\vec{A} \times \vec{B})$?

Q4. Two forces of 5N and 10N are acting at an inclination of 120^0 between them . Find the magnitude and direction of the resultant force.

Q5. Two equal forces have their resultant equal to either. At what angle are they inclined to each other?

Q6. On a certain day rain was falling vertically with a speed of 30m/s. A wind started blowing after some time with a speed of 10m/s in the north to south direction. In which direction should a boy waiting at bus stop hold his umbrella to protect himself from rain?

Q7. To a person going westward with a speed of 6kmph, rain appears to fall vertically downward with a speed of 8kmph. Find the actual speed and direction of rain.

Q8. A train is moving with a velocity of 30kmph due east and a car is moving with a velocity of 40kmph due north. What is the velocity of the car as it appears to passenger in the train?

Q9. given two vectors $\vec{A}$ and $\vec{B}$. Show that $|\vec{A}+\vec{B}|^2 = |\vec{A}|^2 + |\vec{B}|^2$ if and only $\vec{A}$ and $\vec{B}$ are orthogonal.

Q10. Prove that $(\vec{A} + \vec{B}) \cdot (\vec{A} - \vec{B}) = A^2 - B^2$.

Q11. If $\vec{A} \times \vec{B} = \vec{B} \times \vec{C}$, show that $\vec{A} + \vec{B} + \vec{C} = \vec{0}$

Q12. State and prove triangle law of vectors.

Q13. Define the term resultant and equilibrant of two forces. Two force F_1 and F_2 acting at an angle Θ on a body simultaneously have a resultant F. show that $\Theta = \cos^{-1}[(F^2 - F_1^2 - F_2^2)/(2F_1F_2)]$

Q14. If vectors $\vec{A}$ and $\vec{B}$ are added, show that the magnitude of their resultant cannot be greater than (A+B) and smaller than (A-B).

Q15. Five vectors $\vec{A}$, $\vec{B}$, $\vec{C}$, $\vec{D}$ and $\vec{E}$ are represented by the sides of a closed polygon. Marking use of triangle law, prove that their resultant is zero.

Q16. Define relative velocity with the help of a suitable example. Deduce the rule to determine the relative velocity of one body to with respect to another moving body.

Q17. How is the relative velocity of a body A with respect to another body B determined when these are moving in two different direction inclined at an angle Θ?Show that the dot product is distributive or

show that $\vec{A} \cdot (\vec{B} + \vec{C}) = \vec{A} \cdot \vec{B} + \vec{A} \cdot \vec{C}$

Q18. Explain cross product of two vectors. How is the direction of a cross product found?

NUMERICALS

Q19. If   I$\vec{A}$+$\vec{B}$I = I$\vec{A}$-$\vec{B}$I find the angle between them .

Q20. Find the value of n so that (0.4 $\hat{i}$ + 0.8 $\hat{j}$ + n $\hat{k}$) may represent a unit vector

Q21. If $\vec{A}$= (3 $\hat{i}$ + 4 $\hat{j}$) and $\vec{B}$= (7 $\hat{i}$ +24 $\hat{j}$), find a vector having same magnitude as that of $\vec{B}$ and parallel to $\vec{A}$.

Q22. The diagonals of a parallelogram are represented by vectors $\vec{p}$ = (5$\hat{i}$ - 4 $\hat{j}$ + 3 $\hat{k}$) and $\vec{q}$ = (3 $\hat{i}$ + 2 $\hat{j}$ - $\hat{k}$). Find the area of the parallelogram.

Q23. find the value of m such that $\vec{A}$ = (m $\hat{i}$ -2 $\hat{j}$ + $\hat{k}$) and $\vec{B}$ = (2m$\hat{i}$ + m$\hat{j}$ -4 $\hat{k}$) are perpendicular.

Q24. if the resultant of the vectors (3$\hat{i}$ + 4 $\hat{j}$ +5 $\hat{k}$) and (5$\hat{i}$ + 3 $\hat{j}$ +4 $\hat{k}$)makes an angle Θ with X- axis, then find cosΘ.

Q25. find the work done in moving a particle along a vector $\vec{s}$ = (3$\hat{i}$ - $\hat{j}$ + 7$\hat{k}$)m if the applied force is $\vec{F}$ = ($\hat{i}$ + 2 $\hat{j}$ + 4$\hat{k}$)N.

Q26. find the area of a parallelogram determined by the vectors $\vec{A}$ = (3$\hat{i}$ + 2 $\hat{j}$) and $\vec{B}$ =(2$\hat{j}$ - 4$\hat{k}$).

Q27. show that the vector $\vec{A}$ = (3$\hat{i}$ - 2 $\hat{j}$ + $\hat{k}$) and $\vec{B}$ = ($\hat{i}$ - 3$\hat{j}$ + 5$\hat{k}$) and $\vec{C}$ = (2$\hat{i}$ + $\hat{j}$ - 4$\hat{k}$) form a right angle.

Q28. show that the vector $\vec{A}$ = (2$\hat{i}$ - 3 $\hat{j}$ - $\hat{k}$) and $\vec{B}$ = (-6$\hat{i}$ + 9$\hat{j}$ + 3$\hat{k}$) are parallel.

Q29. Find the angle between $\vec{A}$ = 2$\hat{i}$ + 2 $\hat{j}$ - $\hat{k}$ and $\vec{B}$ = -$\hat{i}$ + $\hat{j}$ - 2$\hat{k}$.

Q30. $\hat{i}$ and $\hat{j}$ are unit vectors along X- axis and Y- axis respectively

(i) what is the magnitude and direction of the vectors ($\hat{i}$ +$\hat{j}$) and ($\hat{i}$ -$\hat{j}$)?

(ii)what are the components of a vector $\vec{A}$ = 2$\hat{i}$ + 4 $\hat{j}$ along a direction of , ($\hat{i}$ +$\hat{j}$) and ($\hat{i}$ -$\hat{j}$)?

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