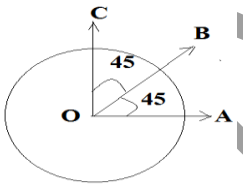
JEE MAIN 2023

SUGGESTION PAPER

SCALARS & *V*ECTOR

1. *Given OA , OB and OC are vectors and R is the radius of the circle .*



(i) Then the resultant of given three vectors as shown in fig .

(ii) $OA + OC$ *is acting along* _____.

(iii) $(OA + OC) + OB$ *is acting along* _____.

2. *With respect to a rectangular cartesian coordinate system , three vectors are expressed as*

$\vec{a} = 4\hat{\imath} - \hat{\jmath}$, $\vec{b} = -3\hat{\imath} + 2\hat{\jmath}$ *and* $\vec{c} = -\hat{k}$

The unit vectors $\hat{r}$ *along the direction of sum of these vector is*

$(a)\ \hat{r} = \frac{1}{\sqrt{3}}(\hat{\imath} + \hat{\jmath} - \hat{k})$

$(b)\ \hat{r} = \frac{1}{\sqrt{2}}(\hat{\imath} + \hat{\jmath} - \hat{k})$

$(c)\ \hat{r} = \frac{1}{3}(\hat{\imath} - \hat{\jmath} + \hat{k})$

$(d)\ \hat{r} = \frac{1}{\sqrt{2}}(\hat{\imath} + \hat{\jmath} + \hat{k})$

3. *The vector* $\vec{b}$ *which is collinear with the vector* $\vec{a} = 2\hat{\imath} + \hat{\jmath} - \hat{k}$ *and satisfies the condition*

$\vec{a}.\vec{b} = 3$, *is*

$(a)\ \frac{1}{2}\vec{a}$ $(b)\ \vec{a}$ $(c)\ 2\vec{a}$ $(d)\ None\ of\ these$

4. *Given two vectors are* $\hat{\imath}-\hat{\jmath}$ *and* $\hat{\imath}+2\hat{\jmath}$ *the unit vector coplanar with the two vectors and perpendicular to first is*

5. *If the vectors* $\vec{a},\vec{b}$ *and* $\vec{c}$ *from the sides BC , CA and AB respectively of a triangle ABC , then*

$(a)\ \vec{a}.\vec{b}=\vec{b}.\vec{c}=\vec{c}.\vec{b}=0$ $(b)\ \vec{a}\times\vec{b}=\vec{b}\times\vec{c}=\vec{c}\times\vec{a}$

$(c)\ \vec{a}.\vec{b}=\vec{b}.\vec{c}=\vec{c}.\vec{a}=0$ $(d)\ \vec{a}\times\vec{a}+\vec{a}\times\vec{c}+\vec{c}\times\vec{a}=0$

6. *The unit vector parallel to the resultant of the vectors* $\vec{A}=4\hat{\imath}+3\hat{\jmath}+6\hat{k}$ *and* $\vec{B}=-\hat{\imath}+3\hat{\jmath}-8\hat{k}$ *is mock* -2

$(a)\ \frac{1}{7}(3\hat{\imath}+6\hat{\jmath}-2\hat{k}\ )$ $(b)\ \frac{1}{7}(3\hat{\imath}+6\hat{\jmath}+2\hat{k}\ )$

$(c)\ \frac{1}{49}(3\hat{\imath}+6\hat{\jmath}-2\hat{k}\ )$ $(d)\ \frac{1}{49}(3\hat{\imath}-6\hat{\jmath}+2\hat{k}\ )$

7. *Let* $\overrightarrow{OA}=\hat{\imath}+3\hat{\jmath}-2\hat{k}$ *and* $\overrightarrow{OB}=3\hat{\imath}+\hat{\jmath}-2\hat{k}$ *. The vector* $\overrightarrow{OC}$ *bisecting the angle AOB and C being the point on the line AB is*

$(a)\ 4(\hat{\imath}+\hat{\jmath}-\hat{k})$ $(b)\ 2(\hat{\imath}+\hat{\jmath}-\hat{k})$ $(c)\ (\hat{\imath}+\hat{\jmath}-\hat{k})$ $(d)None\ of\ these$

8. *A river is flowing from west to east with a speed of* 5 m/min. *A man on the south bank of the river is capable of swimming at* 10 *m/min in still water , he wants to swim across the river in the shortest time . He should swim in a direction –*

(a) *due to north* $(b)\ 30°$ *east of north* $(c)\ 30°$ *west of north* $(d)\ 60°$ *east of north*

9. *A boat takes* 2 *hrs to travel* 8 *km and back in a still water. If the velocity of water is* 4 kmh^{-1} *, the time taken for going upstream of* 8 *km and coming back is*

$(a)\ 2\ h$ $(b)\ 2\ h\ 40$ min $(c)\ 1\ h$ *and* 20 min (d) *Cannot be estimated*

10. P, Q *and* R *are three coplanar forces acting at a point and are in equilibrium .*

Given, $P=1.9318\ kg-wt$, $\sin\theta_1=0.9659$ *, the value of* R *in* $kg-wt$ *is –*

$(a)\ 0.965$ $(b)\ 2$ $(c)\ 1$ $(d)\ 0.5$

11. *If* F_1 *and* F_2 *are two vectors of equal magnitude* F *such that* $|F_1.F_2|=|F_1\times F_2|$*, then* $|F_1+F_2|$ *is equal to –*

$(a)\ \sqrt{(2+\sqrt{2})}F$ $(b)\ F$ $(c)\ \sqrt{2}F$ $(d)\ None\ of\ these$

12. *A vector having magnitude of* 30 *unit , makes equal angles with each of the* X, Y *and* Z *axes. Then the components of the vector along each of* X, Y *and* Z *axes are -*

$(a)\ 10\sqrt{3}\ unit$ $(b)\ \frac{10}{\sqrt{3}}\ unit$ $(c)\ 15\sqrt{3}\ unit$ $(d)\ 10\ unit$

13. *Given that* $A + B + C = 0$ *, out of the three vectors , two are equal in magnitude of the third vector is* $\sqrt{2}$ *times that of either of the two having equal magnitude . Then angle between the vectors a-*

$(a)\ 30°, 60°, 90°$ $(b)\ 45°, 45°, 90°$ $(c)\ 90°, 135°, 45°$ $(d)\ 90°, 135°, 135°$

14. *If two vectors* $2\hat{\imath} + 3\hat{\jmath} + \hat{k}$ *and* $-4\hat{\imath} - 6\hat{\jmath} - \mu\hat{k}$ *are parallel to each other , then value of* μ *is*

$(a)\ zero$ $(b)\ 2$ $(c)\ 3$ $(d)\ 4$

15. *If* $\frac{|a+b|}{|a-b|} = 1$, *then angle between* a & b *is* $-$

$(a)\ 0°$ $(b)\ 45°$ $(c)\ 90°$ $(d)\ 60°$

16. *Unit vector parallel to the resultant of vectors* $4\hat{\imath} - 3\hat{\jmath}$ *and* $8\hat{\imath} + 8\hat{\jmath}$ *will be* $-$

$(a)\ \frac{24\hat{\imath}+5\hat{\jmath}}{13}$ $(b)\ \frac{12\hat{\imath}+5\hat{\jmath}}{13}$ $(c)\ \frac{6\hat{\imath}+5\hat{\jmath}}{13}$ $(d)\ None\ of\ these$

17. *If* A *and* B *are two non* $-$ *zero vectors having equal magnitude , then the angle between the vectors* A *and* $A - B$ *is* $-$

$(a)\ 0°$ $(b)\ 90°$ $(c)\ 180°$ (d) *dependent on the orientation of* A *and* B

18. *If three vectors along coordinate axes respresent the adjacent sides of a cube of length* b, *then the unit vector along its diagonal passing throgh the origin will be* $-$

$(a)\ \frac{\hat{\imath}+\hat{\jmath}+\hat{k}}{\sqrt{2}}$ $(b)\ \frac{\hat{\imath}+\hat{\jmath}+\hat{k}}{\sqrt{3}\ b}$ $(c)\ \frac{\hat{\imath}+\hat{\jmath}+\hat{k}}{\sqrt{3}}$ $(d)\ \hat{\imath} + \hat{\jmath} + \hat{k}$

19. *At what angle should the two forces* $2P$ *and* $\sqrt{2}P$ *act so that the resultant forces is* $P\sqrt{10}$?

$(a)\ 45°$ $(b)\ 60°$ $(c)\ 90°$ $(d)\ 120°$

20. *Component of the vector* $A = 2\hat{\imath} + 3\hat{\jmath}$ *along the vector* $B = (\hat{\imath} + \hat{\jmath})$ *is* $-$

$(a)\ \frac{5}{\sqrt{2}}$ $(b)\ 4\sqrt{2}$ $(c)\ \frac{\sqrt{2}}{3}$ $(d)\ None\ of\ these$

21. Given, $A = \hat{\imath} + \hat{\jmath} + \hat{k}$ and $B = -\hat{\imath} - \hat{\jmath} - \hat{k}$. $(A - B)$ will make an angle with A is $-$

(a) $0°$ (b) $180°$ (c) $90°$ (d) $60°$

22. *Find the* Unit vector perpendicular to vector $A = 3\hat{\imath} + \hat{\jmath}$ and $B = 2\hat{\imath} - \hat{\jmath} - 5\hat{k}$ both is $-$

(a) $\pm\frac{3\hat{j}-2\hat{k}}{\sqrt{11}}$ (b) $\pm\frac{\hat{i}-3\hat{j}+\hat{k}}{\sqrt{11}}$ (c) $\pm\frac{-\hat{j}+2\hat{k}}{\sqrt{13}}$ (d) $\pm\frac{\hat{i}+3\hat{j}-\hat{k}}{\sqrt{13}}$