



N K MATHS ACADEMY

TIRUPUR-98434 34491

UNIT TEST-2022-23

MATHEMATICS

UNIT TEST -6

12

MARKS: 40

TIME: 1.00 HR

I. CHOOSE THE BEST ANSWER:

8X1=8

- If a vector $\vec{\alpha}$ lies in the plane of $\vec{\beta}$ and $\vec{\gamma}$, then
 (1) $[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 1$ (2) $[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = -1$ (3) $[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 0$ (4) $[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 2$
- If $\vec{a}, \vec{b}, \vec{c}$ are three unit vectors such that \vec{a} is perpendicular to \vec{b} , and is parallel to \vec{c} then $\vec{a} \times (\vec{b} \times \vec{c})$ is equal to
 (1) \vec{a} (2) \vec{b} (3) \vec{c} (4) $\vec{0}$
- The volume of the parallelepiped with its edges represented by the vectors $\hat{i} + j, \hat{i} + 2j, \hat{i} + \pi k$ is
 (1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$ (3) π (4) $\frac{\pi}{4}$
- If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar, non-zero vectors such that $[\vec{a}, \vec{b}, \vec{c}] = 3$, then $\{[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}]\}^2$ is equal to
 (1) 81 (2) 9 (3) 27 (4) 18
- If the volume of the parallelepiped with $\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}$ as coterminal edges is 8 cubic units, then the volume of the parallelepiped with $(\vec{a} \times \vec{b}) \times (\vec{b} \times \vec{c}), (\vec{b} \times \vec{c}) \times (\vec{c} \times \vec{a})$ and $(\vec{c} \times \vec{a}) \times (\vec{a} \times \vec{b})$ as coterminal edges is,
 (1) 8 cubic units (2) 512 cubic units (3) 64 cubic unit (4) 24 cubic units
- If $\vec{a}(\vec{b} \times \vec{c}) = (\vec{a} \times \vec{b}) \times \vec{c}$, where $\vec{a}, \vec{b}, \vec{c}$ are any three vectors such that $\vec{b} \cdot \vec{c} \neq 0$ and $\vec{a} \cdot \vec{b} \neq 0$, then \vec{a} and \vec{c} are
 (1) Perpendicular (2) parallel
 (3) Inclined at an angle $\frac{\pi}{3}$ (4) inclined at an angle $\frac{\pi}{6}$
- If $\vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b}) = \vec{x} \times \vec{y}$ then
 (1) $\vec{x} = \vec{0}$ (2) $\vec{y} = \vec{0}$
 (3) \vec{x} and \vec{y} are parallel (4) $\vec{x} = \vec{0}$ or $\vec{y} = \vec{0}$ or \vec{x} and \vec{y} are parallel
- If $[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}] = 64$ then $[\vec{a}, \vec{b}, \vec{c}]$ is
 (1) 32 (2) 8 (3) 128 (4) 0

II. ANSWER ANY 4 QUESTIONS:**4X2=8**

9. A particle acted upon by constant forces $2\hat{i} + 5\hat{j} + 6\hat{k}$ and $-\hat{i} - 2\hat{j} - \hat{k}$ is displaced from the point $(4, -3, -2)$ to the point $(6, 1, -3)$. Find the total work done by the forces.
10. If the vector $a\hat{i} + a\hat{j} + c\hat{k}$, $\hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ are coplanar. Prove that c is the G.M of a and b.
11. The volume of the parallel piped whose cortex minus edges are $7\hat{i} + \lambda\hat{j} - 3\hat{k}$, $\hat{i} + 2\hat{j} - \hat{k}$, $-3\hat{i} + 7\hat{j} + 5\hat{k}$ is 90 cubic units. Find the value of λ .
12. Determine whether the three vectors $2\hat{i} + 3\hat{j} + \hat{k}$, $\hat{i} - 2\hat{j} + 2\hat{k}$ and $3\hat{i} + \hat{j} + 3\hat{k}$ are coplanar.
13. If $\hat{a}, \hat{b}, \hat{c}$ are three vectors prove that $[\hat{a} + \hat{c}, \hat{a} + \hat{b}, \hat{a} + \hat{b} + \hat{c}] = [\hat{a}, \hat{b}, \hat{c}]$.

III. ANSWER ANY 3 QUESTIONS:**3X3=9**

14. Prove that $[\vec{a} \times \vec{b} \quad \vec{b} \times \vec{c} \quad \vec{c} \times \vec{a}] = [\vec{a} \quad \vec{b} \quad \vec{c}]^2$
15. For any vector \vec{a} prove that $\vec{i} \times (\vec{a} \times \vec{i}) + \vec{j} \times (\vec{a} \times \vec{j}) + \vec{k} \times (\vec{a} \times \vec{k}) = 2\vec{a}$.
16. If $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{c} = 3\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{a} \times (\vec{b} \times \vec{c}) = l\vec{a} + m\vec{b} + n\vec{c}$ Find the value of l, m, n
17. If $\vec{a}, \vec{b}, \vec{c}$ are three unit vectors such that \vec{b} and \vec{c} are non-parallel and $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{1}{2}\vec{b}$, Find the angle between \vec{a} and \vec{c} .

IV. ANSWER ANY 3 QUESTIONS:**3X5=15**

18. Prove by vector method that $\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$.
19. Prove that vector method that the perpendicular (attitudes) from the vertices to the opposite sides of a triangle is concurrent.
20. If $\vec{a} = \hat{i} - \hat{j}$, $\vec{b} = \hat{i} - \hat{j} - 4\hat{k}$, $\vec{c} = 3\hat{j} - \hat{k}$ and $\vec{d} = 2\hat{i} + 5\hat{j} + \hat{k}$, verify that $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) = [\vec{a}, \vec{b}, \vec{d}]\vec{c} - [\vec{a}, \vec{b}, \vec{c}]\vec{d}$.
21. If $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$, $\vec{b} = 3\hat{i} + 5\hat{j} + 2\hat{k}$, $\vec{c} = -\hat{i} - 2\hat{j} + 3\hat{k}$ verify that $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \cdot \vec{c})\vec{b} - (\vec{a} \cdot \vec{b})\vec{c}$.