CUET Mathematics Test

Chapter: Vectors and Three-Dimensional Geometry

General Instructions

1. Total Questions: **20**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Each question carries **5 marks**.
5. For each correct answer: **+5 marks**.
6. For each incorrect answer: **-1 mark**.
7. No negative marking for unanswered questions.
8. Use of calculator or electronic devices is strictly prohibited.
9. Choose the most appropriate answer from the given options.

1. If the angle between the vectors $\vec{a} = \hat{i} - \hat{j} + k\hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + \hat{k}$ is $\pi/3$, then the value of k is:
   (A) $\sqrt{2} \pm \sqrt{3}$
   (B) $2 \pm \sqrt{6}$
   (C) $1 \pm \sqrt{2}$
   (D) $5 \pm 2\sqrt{6}$

2. The projection of vector $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on vector $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$ is:
   (A) $10/\sqrt{6}$
   (B) $5\sqrt{6}/3$
   (C) $4/\sqrt{6}$
   (D) $2/3$

3. If $|\vec{a}| = 3$, $|\vec{b}| = 4$ and the angle between them is $60°$, then the area of the parallelogram whose diagonals are $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ is:
   (A) $6\sqrt{3}$ sq. units
   (B) $12\sqrt{3}$ sq. units
   (C) $3\sqrt{3}$ sq. units
   (D) $24\sqrt{3}$ sq. units

4. A line makes angles α, β, γ with the coordinate axes. If $\alpha = 45°$ and $\beta = 60°$, then the possible value of γ is:
   (A) $30°$
   (B) $45°$
   (C) $60°$
   (D) $90°$

5. The direction ratios of a line passing through the points $(2, -1, 4)$ and $(1, 0, -2)$ are:
   (A) $(1, -1, 6)$
   (B) $(3, -1, 2)$
   (C) $(-1, 1, -6)$
   (D) $(1, 1, 6)$

6. The Cartesian equation of a line passing through point $(1, 2, 3)$ and parallel to the vector $3\hat{i} - \hat{j} + 2\hat{k}$ is:
   (A) $\frac{x-3}{1} = \frac{y+1}{2} = \frac{z-2}{3}$
   (B) $\frac{x-1}{3} = \frac{y-2}{-1} = \frac{z-3}{2}$
   (C) $\frac{x+1}{3} = \frac{y+2}{-1} = \frac{z+3}{2}$
   (D) $\frac{x-1}{-3} = \frac{y-2}{1} = \frac{z-3}{-2}$

7. If the lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-1}{1} = \frac{z-6}{-5}$ are perpendicular, then k is:
   (A) $-10/7$
   (B) $10/7$
   (C) $-7/10$
   (D) $5/7$

8. The angle between the lines $\vec{r} = (\hat{i} + 2\hat{j} - 4\hat{k}) + \lambda(2\hat{i} - \hat{j} + 2\hat{k})$ and $\vec{r} = (3\hat{i} + 3\hat{j} - 5\hat{k}) + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$ is:
   (A) $\cos^{-1}(16/21)$
   (B) $\cos^{-1}(8/21)$
   (C) $\cos^{-1}(19/21)$
   (D) $90°$

9. The distance between the parallel lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{2} = \frac{y-4}{3} = \frac{z-5}{4}$ is:
   (A) $\sqrt{29}$
   (B) $\sqrt{6}/29$
   (C) $\sqrt{293/29}$
   (D) $\sqrt{14/29}$

10. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, then the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$ is:
   (A) 3/2
   (B) $-3/2$
   (C) 0
   (D) 3

11. The shortest distance between the lines $\vec{r} = \hat{i} + 2\hat{j} + \hat{k} + \lambda(\hat{i} - \hat{j} + \hat{k})$ and $\vec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu(2\hat{i} + \hat{j} + 2\hat{k})$ is:
   (A) $3\sqrt{2}$
   (B) $3/\sqrt{2}$
   (C) $5\sqrt{2}$
   (D) 0

12. If the vectors $\vec{a} = 2\hat{i} - \lambda\hat{j} + 3\hat{k}$ and $\vec{b} = 4\hat{i} - 2\hat{j} + 6\hat{k}$ are parallel, then λ is:
   (A) 1
   (B) 2
   (C) 3
   (D) 4

13. The coordinates of the foot of the perpendicular from $(0, 2, 3)$ to the line $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$ are:
   (A) $(2, 3, -1)$
   (B) $(-3, 1, -4)$
   (C) $(2, -1, 3)$
   (D) $(2, 3, 1)$

14. If $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$ and $\vec{a} \times \vec{c} = \vec{b} \times \vec{d}$, then the vector $\vec{a} - \vec{d}$ is:
   (A) Parallel to $\vec{b} - \vec{c}$
   (B) Perpendicular to $\vec{b} - \vec{c}$
   (C) Equal to $\vec{b} - \vec{c}$
   (D) Parallel to $\vec{b} + \vec{c}$

15. The image of point $(1, 6, 3)$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ is:
   (A) $(1, 0, 7)$
   (B) $(-1, -6, -3)$
   (C) $(1, 2, 3)$
   (D) $(0, 1, 2)$

16. If $|\vec{a} \times \vec{b}|^2 + (\vec{a} \cdot \vec{b})^2 = 144$ and $|\vec{a}| = 4$, then $|\vec{b}|$ is:
   (A) 3
   (B) 4
   (C) 12
   (D) 9

17. The shortest distance between x-axis and the line $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ is:
   (A) $\sqrt{13}/3$
   (B) $\sqrt{13}$
   (C) $2/\sqrt{13}$
   (D) $3/\sqrt{13}$

18. A unit vector perpendicular to both $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + 2\hat{k}$ is:
    (A) $\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} - \hat{k})$
    (B) $\frac{1}{\sqrt{19}}(3\hat{i} - 3\hat{j} - 3\hat{k})$
    (C) $\frac{1}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k})$
    (D) $\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} + \hat{k})$

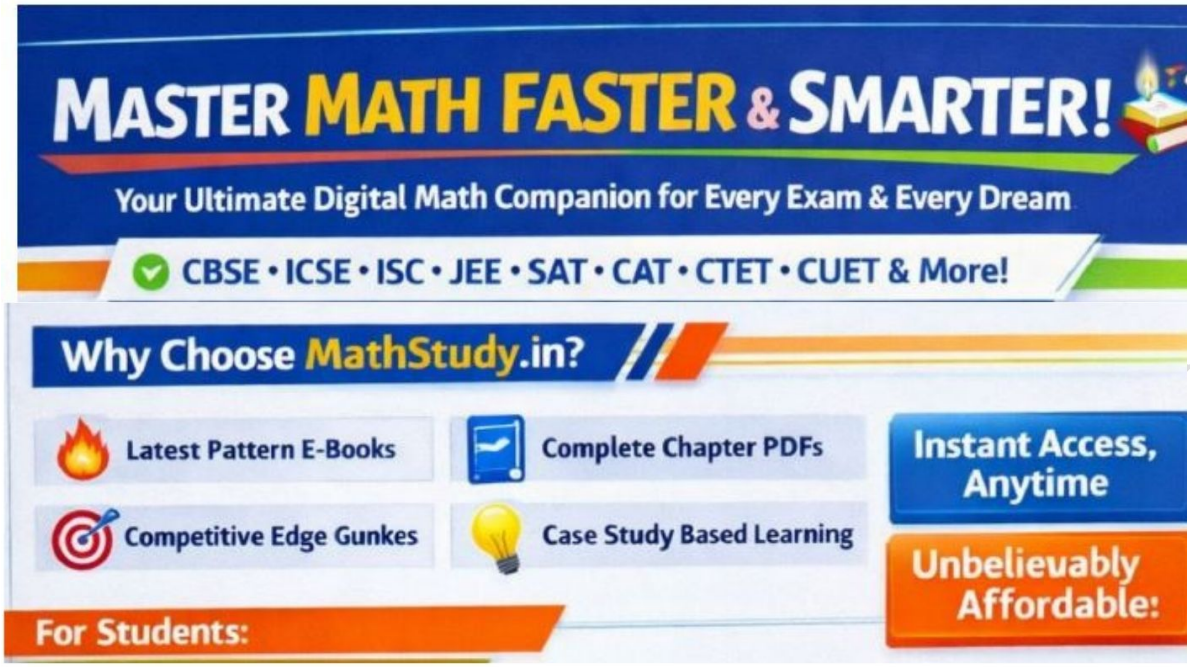
19. If direction cosines of a line are (k, k, k), then:
    (A) $k = 1$
    (B) $k = 1/3$
    (C) $k = 1/\sqrt{3}$ or $-1/\sqrt{3}$
    (D) $k = 1/9$

20. If $\vec{a}$ and $\vec{b}$ are two unit vectors and θ is the angle between them, then $\vec{a} + \vec{b}$ is a unit vector if θ is:
    (A) $\pi/4$
    (B) $\pi/3$
    (C) $2\pi/3$
    (D) $\pi/2$

SOLUTIONS

www.udgamwelfarefoundation.com

For Best Mathematics E-Books, Visit:
www.mathstudy.in



Special Features

- **Board-Specific** – CBSE, ICSE, ISC, State Boards
- **Exam-Focused** – JEE, SAT, CAT, CTET, CUET, NTSE
- **Grade-Wise** – Class 6 to 12
- **Bilingual Options** – English & Hindi Medium Support
- **Printable & Shareable** – Use offline, anytime

How to Order:

Visit : https://www.mathstudy.in
Browse by Exam, Class, or Topic
Add to Cart & Checkout

Contact & Support:

Email: admin@mathstudy.in
WhatsApp Support Available : +91-+91 92118 65759

Why Wait? Empower your learning journey, save time, and achieve your dreams!

Explore & Start Learning Today:
https://www.mathstudy.in – Premium eBooks for success
https://www.udgamwelfarefoundation.com – Free PDFs, practice tests, & guida

MathStudy.in — Empowering Learners, Enabling Educators, Encouraging Excellence.
Digital Learning | Affordable Excellence | Trusted by Thousands