VECTORS

Single Correct Answer Type:

1. If M and N are the mid points of the diagonals AC and BD respectively of a quadrilateral ABCD, then $AB + AD + CB + CD =$
   (A) 4 NM (B) 4 MN (C) 2 MN (D) None of these

2. ABCD is a quadrilateral and E the point of intersection of the lines joining the middle points of opposite sides. If O is any point, then the resultant of OA, OB, OC and OD is equal to
   (A) 2OE (B) OE (C) 4OE (D) None of these

3. Two forces act at the vertex A of a quadrilateral ABCD represented by AB, AD and two at C represented by CB and CD. If E and F are the middle points of AC and BD respectively, then their resultant is represented by
   (A) EF (B) 2EF (C) $\frac{3}{2}$EF (D) 4EF

4. Let ABCDEF be a regular hexagon. If $AD = xBC$ and $CF = yAB$, then $xy =$
   (A) 4 (B) – 4 (C) 2 (D) – 2

5. $AB = 3i + j - k$ and $AC = i - j + 3k$. If the point P on the line segment BC is equidistant from AB and AC, then AP is
   (A) $2i - k$ (B) $i - 2k$ (C) $2i + k$ (D) None of these

6. If $\vec{a}$ and $\vec{b}$ are unit vectors, then the greatest value of $|\vec{a} + \vec{b}| + |\vec{a} - \vec{b}|$ is
   (A) $2\sqrt{2}$ (B) $\sqrt{2}$ (C) 2 (D) $4\sqrt{2}$

7. $\vec{a}$ and c are unit vectors and $|\vec{b}| = 4$. The angle between $\vec{a}$ and $\vec{c}$ is $\cos^{-1}\left(\frac{1}{4}\right)$. If $\vec{b} - 2\vec{c} = \lambda\vec{a}$, then λ is equal to
   (A) $3, 4$ (B) $-3, 4$ (C) $3, -4$ (D) $\frac{1}{4}, \frac{3}{4}$

8. Let $a = 2i - j + k$, $b = i + 2j - k$ and $c = i + j - 2k$ be three vectors. A vector in the plane of b a and c whose projection on a is of magnitude $\sqrt{\frac{2}{3}}$ is
   (A) $2i - 3j - \frac{3}{2}k$ (B) $2i + 3j + 3k$
   (C) $-2i - j + 5k$ (D) $2i + j + 5k$

9. A parallelogram is constructed on the vector $a = 3p - q$ and $b = p + 3q$, given that $|p| = |q| = 2$ and the angle between p and q is $\frac{\pi}{3}$. The length of a diagonal is
   (A) $4\sqrt{5}$ (B) $4\sqrt{3}$ (C) $4\sqrt{7}$ (D) None of these

10. a and b are mutually perpendicular unit vectors. If r is a vector satisfying $r.a = 0$, $r.b = 1$ and $[r\ a\ b] = 1$, then r is
    (A) $a \times b + b$ (B) $a + (a \times b)$ (C) $b + (a \times b)$ (D) $a \times b + a$

11. Given a cube $ABCDA_1B_1C_1D_1$ with lower base ABCD, upper base $A_1B_1C_1D_1$ and the lateral edges AA_1, BB_1, CC_1 and DD_1; M and M_1 are the centres of the faces ABCD and $A_1B_1C_1D_1$ respectively. O is a point on line MM_1, such that $OA + OB + OC + OD = OM_1$, then $OM = \lambda OM_1$ if $\lambda =$

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{1}{6}$ (D) $\frac{1}{8}$

12. If $r = \lambda(a \times b) + \mu(b \times c) + v(c \times a)$ and $[abc] = \frac{1}{8}$, then $\lambda + \mu + v$ is equal to

(A) $r.(a+b+c)$ (B) $8r.(a+b+c)$ (C) $4r.(a+b+c)$ (D) None of these

13. Let $a = a_1i + a_2j + a_3k$, $b = b_1i + b_2j + b_3k$ and $c = c_1i + c_2j + c_3k$ be three non zero vectors and such that c is a unit vector perpendicular to both vectors a and b. If the angle between vectors a and b is $\pi/6$, then

$\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$ is equal to

(A) 0 (B) 1

(C) $\frac{1}{4}\left(a_1^2 + a_2^2 + a_3^2\right)\left(b_1^2 + b_2^2 + b_3^2\right)$ (D) $\frac{3}{4}\left(a_1^2 + a_2^2 + a_3^2\right)\left(b_1^2 + b_2^2 + b_3^2\right)\left(c_1^2 + c_2^2 + c_3^2\right)$

14. If the vectors a and b are perpendicular to each other, then a vector v in a terms of a and b satisfying the equations $v.a = 0$, $v.b = 1$ and $[v\,a\,b] = 1$ is

(A) $\frac{1}{|b|^2}b + \frac{1}{|a \times b|^2}a \times b$ (B) $\frac{b}{|b|} + \frac{a \times b}{|a \times b|^2}$ (C) $\frac{b}{|b|^2} + \frac{a \times b}{|a \times b|}$ (D) None of these

15. If S is the circumcentre, O is the orthocentre of ΔABC then $SA + SB + SC =$

(A) SO (B) 2SO (C) OS (D) 2OS

16. If $4a + 5b + 9c = 0$, then $(a \times b) \times [(b \times c) \times (c \times a)]$ is equal to

(A) A vector perpendicular to the plane of a, b and c

(B) A scalar quantity

(C) 0

(D) None of these

17. Forces P, Q act at O and have a resultant R, if any transversal cuts their lines of action at A, B, C respectively, then

(A) $\frac{P}{OA} + \frac{Q}{OB} + \frac{R}{OC} = 0$ (B) $\frac{P}{OA} + \frac{Q}{OB} + \frac{R}{OC} = 1$ (C) $\frac{P}{OA} + \frac{Q}{OB} - \frac{R}{OC} = 0$ (D) $\frac{P}{OA} + \frac{Q}{OB} - \frac{R}{OC} = 1$

18. A vector A has components A_1, A_2, A_3 in a right handed rectangular Cartesian coordinate system Ox, Oy, Oz. The coordinate system is rotated about the z-axis through an angle $\frac{\pi}{2}$. The components of A in the new coordinate system are

(A) $A_1, -A_2, A_3$ (B) A_2, A_1, A_3 (C) $A_1, A_2, -A_3$ (D) $A_2, -A_1, A_3$

19. If b and c are any two non-collinear unit vectors and a is any vector, then $(a.b)b + (a.c)c + \frac{a.(b+c)}{|b+c|^2}(b \times c) =$

(A) a (B) b (C) c (D) None of these

20. If $p \times q = r$ and $p.q = c$, then q =

(A) $\frac{cp - p \times r}{|p|^2}$ (B) $\frac{cp + p \times r}{|p|^2}$ (C) $\frac{cr - p \times r}{|p|^2}$ (D) $\frac{cp + p \times r}{|p|^2}$

Integer Based:

21. If a quadrilateral ABCD is such that $AB = b$, $AD = d$ and $AC = mb + pd(m + p \geq 1)$, then the area of the quadrilateral is $k(p+m)|b \times d|$, where k is equal to

22. Let u and v be unit vectors. If w is a vector such that $w + (w \times u) = v$ and $|(u \times v).w| \leq k$, then k is

23. In a parallelogram ABCD, $|AB| = a$, $|AD| = b$ and $|AC| = c$ and DB.AB $= \frac{k_1 a^2 + b^2 - c^2}{k_2}$, then $k_1 + k_2$ value is

24. a, b, c are three vectors of magnitude, $\sqrt{3}, 1, 2$ such that $a \times (a \times c) + 3b = 0$. If θ is the angle between a and c, then $\cos^2\theta$ is equal to

25. If 'O' (origin) is a point inside ΔPQR such that $\overline{OP} + K_1\overline{OG} + K_2\overline{OR} = 0$ where K_1, K_2 are constants such that $\frac{\text{Area of } \Delta PQR}{\text{Area of } \Delta OQR} = 4$, then the value of $K_1 + K_2$ is

KEY

1.	B	2.	C	3.	D	4.	B	5.	C
6.	A	7.	C	8.	C	9.	B	10.	A
11.	A	12.	B	13.	C	14.	A	15.	A
16.	C	17.	C	18.	D	19.	A	20.	A
21.	0.5	22.	0.5	23.	5	24.	0.75	25.	3

❈ *Wish You all the Best* ❈