

Model Question Paper 3
VECTOR ALGEBRA 3

11th Standard

Maths

Reg.No. :

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Answer all the Questions

Time : 02:30:00 Hrs

Total Marks : 100

8 x 1 = 8

Part A

- 1) The unit vector parallel to \vec{a} are
(a) $\hat{a} = \frac{\vec{a}}{|\vec{a}|}$ (b) $\pm |\vec{a}|$ (c) $\vec{a} = |\vec{a}| \hat{a}$ (d) $\pm (\hat{a})$
- 2) Which one of the following is Vector Quantity
(a) Work (b) Mass (c) Weight (d) none
- 3) The word Vector is
(a) German (b) American (c) Latin (d) Irish
- 4) P and Q are two points with position vectors $3\vec{a} - 2\vec{b}$ and $\vec{a} + \vec{b}$ respectively, then the position vector of a point R which divides the line segment PQ in the ratio 2:1 externally is,
(a) $\vec{a} + 4\vec{b}$ (b) $\vec{a} - 4\vec{b}$ (c) $-\vec{a} + 4\vec{b}$ (d) $-\vec{a} - 4\vec{b}$
- 5) The direction cosines of the vector $-2\vec{i} + \vec{j} - 5\vec{k}$
(a) -2,1,-5 (b) $\frac{-1}{\sqrt{30}}, \frac{1}{\sqrt{30}}, \frac{-5}{\sqrt{30}}$ (c) $\frac{-2}{\sqrt{30}}, \frac{1}{\sqrt{30}}, \frac{-5}{\sqrt{30}}$ (d) 2,-1,5
- 6) Classify the vector quantities from the following.
(i) time period (ii) distance
(iii) force (iv) velocity
(a) (i) and (ii) (b) (ii) and (iii) (c) (iii) and (iv) (d) (iv) and (i)
- 7) If $\vec{a} = \vec{i} + 2\vec{j} + 2\vec{k}$, $\vec{b} = 2\vec{i} - \vec{j} - \vec{k}$ then $|\vec{a} + \vec{b}|^2$
(a) 11 (b) $\sqrt{11}$ (c) -11 (d) $-\sqrt{11}$
- 8) If $\vec{a} = \vec{i} + 2\vec{j} + 2\vec{k}$, $\vec{b} = 2\vec{i} - \vec{j} - \vec{k}$ then $|\vec{a} - \vec{b}|^2$ is
(a) $\sqrt{19}$ (b) 19 (c) -19 (d) $-\sqrt{19}$

Part B

10 x 2 = 20

- 9) Show that the vectors $\vec{a} - 2\vec{b} + 3\vec{c}$, $\vec{a} - 3\vec{b} + 5\vec{c}$ and $-2\vec{a} + 3\vec{b} - 4\vec{c}$ are coplanar where \vec{a} , \vec{b} , \vec{c} are non coplanar.
- 10) Prove that the medians of a triangle meet at a point.
- 11) Prove that the line segment joining the mid points of the two sides of a triangle is parallel to the third side and equal to half of it.
- 12) If the position vector \vec{a} of the point $(-4, \lambda, 3)$ be such that $|\vec{a}| = 13$ find λ .
- 13) If the position vectors of the points A, B, C, D are $\vec{a} = 2\vec{i} + 4\vec{k}$, $\vec{b} = 5\vec{i} + 3\sqrt{3}\vec{j} + 4\vec{k}$, $\vec{c} = -2\sqrt{3}\vec{j} + \vec{k}$ and $\vec{d} = 2\vec{i} - \vec{k}$ respectively. Prove that CD is parallel to AB.
- 14) Show that the points whose position vectors are $-2\vec{i} + 3\vec{j} + 5\vec{k}$, $\vec{i} + 2\vec{j} + 3\vec{k}$ and $7\vec{i} - \vec{k}$ are collinear.
- 15) Show that the points whose position vectors are given by $-2\vec{i} - \vec{j} + \vec{k}$, $\vec{i} - 3\vec{j} - 5\vec{k}$ and $3\vec{i} - 4\vec{j} - 4\vec{k}$ form a right angled triangle.
- 16) If $\vec{PO} + \vec{OQ} = \vec{QO} + \vec{OR}$, show that the points P, Q, R are collinear.
- 17) If D is the mid point of the side BC of a triangle ABC, prove that $\vec{AB} + \vec{AC} = 2\vec{AD}$.
- 18) L and M are midpoints of sides BC and DC of a parallelogram ABCD. prove that $\vec{AL} + \vec{AM} = \frac{3}{2}\vec{AC}$

Part C

9 x 3 = 27

- 19) if \vec{a} and \vec{b} are any two vectors and m is a scalar then $m(\vec{a} + \vec{b}) = m\vec{a} + m\vec{b}$
- 20) $\vec{AB} = \vec{OB} - \vec{OA}$ where \vec{OA} and \vec{OB} are the PVs of A and B respectively.
- 21) Let A and B be two points with position vectors \vec{a} and \vec{b} respectively and let P be a point dividing AB internally in the ratio m : n. Then the position vector of P is given by
$$\vec{OP} = \frac{n\vec{a} + m\vec{b}}{m+n}$$
- 22) Let \vec{a} and \vec{b} be two non-collinear vectors and \vec{r} be a vector coplanar with them. Then \vec{r} can be expressed uniquely as $\vec{r} = l\vec{a} + m\vec{b}$ where l, m are scalars
- 23) If P is a point in a two dimensional plane which has coordinates (x, y) then $\vec{OP} = x\vec{i} + y\vec{j}$ where \vec{i} , \vec{j} are unit vectors along OX and OY respectively.
- 24) If \vec{a} , \vec{b} , \vec{c} are three given non-coplanar vectors then every vector \vec{r} space can be uniquely expressed as $\vec{r} = l\vec{a} + m\vec{b} + n\vec{c}$ for some scalars l, m and n
- 25) If a point P in space has coordinate (x, y, z) then its position vector $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ and $|\vec{r}| = \sqrt{x^2 + y^2 + z^2}$ where \vec{i} , \vec{j} , \vec{k} are unit vectors along OX, OY and OZ respectively
- 26) $2\vec{i} - \vec{j} + 7\vec{k}$ என்ற வெக்டரின் எண்ணளவு மற்றும் திசைக் கொசைன்களை காண்க.

- 28) Express \vec{AB} in terms of unit vectors \vec{i} and \vec{j} where the points are A(-6, 3) and B(-2, -5). Find also $\left| \vec{AB} \right|$
- 29) Find the magnitude and direction cosines of $2\vec{i} - \vec{j} + 2\vec{k}$
- 30) Find the unit vector in the direction of $3\vec{i} + 4\vec{j} - 12\vec{k}$
- 31) Find the sum of the vectors $\vec{i} - \vec{j} + 2\vec{k}$ and $2\vec{i} + 3\vec{j} - 4\vec{k}$ and also find the modulus of the sum.
- 32) If the position vectors of the two points A and B are $\vec{i} + 2\vec{j} - 3\vec{k}$ and $2\vec{i} - 4\vec{j} + \vec{k}$ respectively then find $\left| \vec{AB} \right|$
- 33) Find the unit vectors parallel to the vector $-3\vec{i} + 4\vec{j}$
- 34) Find the vectors of magnitude 5 units, which are parallel to the vector $2\vec{i} - \vec{j}$
- 35) Show that the points whose position vectors $2\vec{i} + 3\vec{j} - 5\vec{k}$, $3\vec{i} + \vec{j} - 2\vec{k}$ and $6\vec{i} - 5\vec{j} + 7\vec{k}$ are collinear.
- 36) If the position vectors $3\vec{i} - 7\vec{j} - 7\vec{k}$, $5\vec{i} + 4\vec{j} + 3\vec{k}$ of A and B are find \vec{AB} and determine its magnitude and direction cosines.

