Vectors(HA-1)

SECTION 1: MCQ

Q1 Among the following, the vector quantity is   (4 Marks)
    A. Pressure
    B. Gravitational potential
    C. Stress
    D. Impulse
    E. Distance

Q2 A set of vectors taken in a given order gives a closed polygon. Then the resultant of these vectors is   (4 Marks)
    A. scalar quantity
    B. pseudo vector
    C. unit vector
    D. null vector

Q3 The magnitude of two vectors P and Q differ by 1. The magnitude of their resultant makes an angle   (4 Marks)
of $\tan^{-1}(3/4)$ with P. The angle between P and Q is
    A. 45°
    B. 0°
    C. 180°
    D. 90°

Q4 Two equal forces (P each) act at a point inclined to each other at an angle of 120^0. The magnitude of   (4 Marks)
their resultant is:
    A. $P/2$
    B. $P/4$
    C. P
    D. $2P$

Q5 Match vector operations between two vectors A and B in column I with angles between the two   (4 Marks)
vectors in column II :

  Column-I   Column-II

a) $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$ e) 45^0

b) $|\vec{A} \times \vec{B}| = \vec{A}.\vec{B}$ f) 30^0

c) $\vec{A}.\vec{B} = \dfrac{AB}{2}$ g) 90^0

d) $|\vec{A} \times \vec{B}| = \dfrac{AB}{2}$ h) 60^0

    A. a → e; b → g; c → f; d → h
    B. a → g; b → e; c → h; d → f
    C. a → g; b → f; c → e; d → h
    D. a → e; b → g; c → h; d → f

Q6 If the vectors $(\hat{i} + \hat{j} + \hat{k})$ and $3\hat{i}$ form two sides of a triangle, then area of the triangle is: (4 Marks)

A. $\sqrt{3}\,unit$

B. $2\sqrt{3}\,unit$

C. $\frac{3}{\sqrt{2}}\,unit$

D. $3\sqrt{2}\,unit$

Q7 If $\vec{e_1}$ and $\vec{e_2}$ are two unit vectors and θ is the angle between them, then $sin\left(\dfrac{\theta}{2}\right)$ is: (4 Marks)

A. $\dfrac{1}{2}\left|\vec{e_1} + \vec{e_2}\right|$

B. $\dfrac{1}{2}\left|\vec{e_1} - \vec{e_2}\right|$

C. $\dfrac{\vec{e_1}.\vec{e_2}}{2}$

D. $\dfrac{\left|\vec{e_1} \times \vec{e_2}\right|}{2\left|\vec{e_1}\right|\left|\vec{e_2}\right|}$

Q8 If the vectors $\overrightarrow{P} = a\hat{i} + a\hat{j} + 3\hat{k}$ and $\overrightarrow{Q} = a\hat{i} - 2\hat{j} - \hat{k}$ are perpendicular to each other then the positive value of 'a' is (4 Marks)

A. Zero

B. 1

C. 2

D. 3

SECTION 2: More Than One Correct

Q1 A zero vector has (4 Marks)

A. Any direction

B. Many directions

C. No direction

D. None of these

Q2 If $\vec{\nu}_1 + \vec{\nu}_2$ is perpendicular to $\vec{\nu}_1 - \vec{\nu}_2$, then (4 Marks)

A. $\vec{\nu}_1$ is perpendicular to $\vec{\nu}_2 c$

B. $\left|\vec{\nu}_1\right| = \left|\vec{\nu}_2\right|$

C. $\vec{\nu}_1$ is a null vector

D. The angle between $\vec{\nu}_1$ and $\vec{\nu}_2$ can have any value

Q3 Which of the following statement(s) is/are incorrect? (4 Marks)

A. $\vec{a}$ and $-\vec{a}$ are collinear.

B. Two collinear vectors are always equal in magnitude.

C. Two vectors having same magnitude are collinear.

D. Two collinear vectors having the same magnitude are equal.

Q4 The product of two vectors $\vec{A}$ and $\vec{B}$ may be: (4 Marks)

A. $\geq AB$

B. $\leq AB$

C. $< AB$

D. zero

Q5 A situation may be described by using different sets of coordinate axes having different orientations. (4 Marks)
Which of the following do not depend on the orientation of the axes?
A. The value of a scalar
B. Component of a vector
C. A vector
D. The magnitude of a vector

Q6 Let $a = 2i - j + k, b = i + 2j - k$ and $c = i + j - 2k$ be three vectors. A vector in the plane of (4 Marks)

b and c whose projection on a is of magnitude $\sqrt{\dfrac{2}{3}}$ is

A. $2i + 3j - 3k$
B. $2i + 3j + 3k$
C. $2i - j + 5k$
D. $2i + j + 5k$

Q7 Find the unit vectors which are perpendicular to both the vector $i + 4j$ and $2i + 4j + 3k$. (4 Marks)
A. $\dfrac{12i - 3j - 4k}{13}$
B. $\dfrac{-12i + 3j + 4k}{13}$
C. $\dfrac{12i + 3j - 4k}{13}$
D. $\dfrac{-12i - 3j - 4k}{13}$

SECTION 3: Subjective

Q1 What is a zero vector ? (4 Marks)

Q2 Find the unit vector in the direction of $\overline{PQ}$, where P and Q have co-ordinates $(5, 0, 8)$ and $(3, 3, 2)$ (4 Marks)
, respectively.

Q3 Two vectors are given by $\vec{a} = -2\hat{i} + \hat{j} - 3\hat{k}$ and $\vec{b} = -5\hat{i} + 3\hat{j} - 2\hat{k}$. If $3\vec{a} + 2\vec{b} - \vec{c} = 0$ (4 Marks)
then third

Q4 The resultant of $\vec{P}$ and $\vec{Q}$ is $\vec{R}$. If $\vec{Q}$ isdoubled, $\vec{R}$ is doubled; when $\vec{Q}$ is reversed, $\vec{R}$ is again (4 Marks)
doubled. Find $P : Q : R$.

Q5 If vectors A B and C have magnitude $8,15,$ and 17 units and A and B =C (4 Marks)