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# SIIIS 190 B-2K13

## B.A./B.Sc. IIIrd Semester Degree Examination

## Mathematics

## (Vectors and Solid Geometry)

## Paper - 3.1

Time : 3 Hours Maximum Marks :60

***Instructions to Candidates:***

Answer **all** sections.

### Section - A

Answer any **ten** of the following : **(10×2=20)**

1. Find $\vec{a}.(\vec{b}\times\vec{c})$, if $\vec{a}=3i-j+2k$, $\vec{b}=2i+j-k$ and $\vec{c}=i-2j+k$
2. Show that $\vec{a}\times(\vec{b}\times\vec{c})+\vec{b}\times(\vec{c}\times\vec{a})+\vec{c}\times(\vec{a}\times\vec{b})=0$
3. If $\vec{a},\vec{b},\vec{c}$ and $\vec{a}',\vec{b}',\vec{c}'$ are reciprocal system of vectors then show that $\vec{a}\times\vec{a}'+\vec{b}\times\vec{b}'+\vec{c}\times\vec{c}'=0$
4. Prove that the distributive law $\vec{a}\times(\vec{b}+\vec{c})=(\vec{a}\times\vec{b})+(\vec{a}\times\vec{c})$
5. Show that the points (3,2,-4), (5,4,-6) and (9,8,10) are collinear by using the concept of direction ratio's.
6. Find the coordinates of the point which divides the join of (2,-3,1) and (3,2,-1) in the ratio 2:3
7. If $\alpha,\beta$, and $\gamma$ are the angles made by a Line with coordinate axes, then show that $\sin^2\alpha+\sin^2\beta+\sin^2\gamma=2$.
8. Find the angle between AB and CD where A = (1,2,3), B = (2,3,-1), C = (3,5,-3) and D = (3,5,7).
9. Find the area of a Triangle whose vertices are (2,5,-4), (-1,4,-3) and (4,7,-6)

10. Find the equation of the plane Through the point (-10,5,4) and perpendicular to the line joining the points (4,-1,2) and (-3,2,3).

11. Find the angle between the line $\frac{x-3}{2}=\frac{y+1}{-1}=\frac{z+4}{3}$ and the plane $2x+3y-z-4=0$

12. Find the shortest distance between the lines joining the points (1,2,3),(2,4,5) and (2,3,5), (3,4,5).

## Section - B

Answer any **two** of the following **(2×5=10)**

1. Show that $(\vec{a}\times\vec{b})\times(\vec{c}\times\vec{d})=[abd]c-[abc]d$

2. Show that the vectors $\vec{a}\times(\vec{b}\times\vec{c}),\vec{b}\times(\vec{c}\times\vec{a})$ and $\vec{c}\times(\vec{a}\times\vec{b})$ are coplanar.

3. If $\vec{a},\vec{b},\vec{c}$ are three non-coplanar vectors, then express $\vec{b}\times\vec{c}$ in terms of $\vec{a},\vec{b},\vec{c}$

## Section - C

Answer any **three** of the following. **(3×5=15)**

1. Find the angle between the diagonals of a cube.
2. The direction cosines of two lines which are connected by the relation $l-5m+3n=0$ and $7l^2+5m^2-3n^2=0$
3. Find the angle between the two lines whose direction cosines satisfy the Equations. $l+m+n=0$ and $2l+2m-nm=0$
4. Find the projection of the line segment AB on CD where A = (1,3,5), B = (6,4,3), C = (2,-1,4) and D = (0,1,5)

## Section - D

Answer any **three** of the following **(3×5=15)**

1. Find the equation of the plane passing through the point and Parallel to the lines joining the points A(3,-1,0), B(2,1,0) and C(1,-1,0), D(-1,2,0).

2. Show that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-4}{5}=\frac{y-5}{6}=\frac{z-6}{7}$ are coplanar and find their point of intersection. Also find the equation containing them.

3. Find the reflection of the point (1,-1,0) in the line $\frac{2x-4}{2}=\frac{1-y}{-2}=\frac{z+3}{-1}$.

4. Find the length and the equation of the shortest distance between the lines $\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$ and $\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$

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