(ii) Questions : 8 Sub. Code :

Exam. Code:

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## B.A./B.Sc. (General) 2nd Semester 1048

## MATHEMATICS Paper : I Solid Geometry

Time : 3 Hours]
[Max. Marks: 30
Note :- Attempt five questions, selecting at least two questions from each section. All questions carry equal marks.

1. (a) Shift the origin to a suitable point so that the equation $x^{2}+y^{2}+z^{2}-4 x-8 y+6 z-4=0$ is transformed into an equation in which the first degree terms are absent.
(b) Transform the equation $13 x^{2}+13 y^{2}+10 z^{2}+8 x y-4 y z$ $-4 z x-144=0$ when the axes are rotated to the axes having direction cosines

$$
\left\langle-\frac{1}{3}, \frac{2}{3}, \frac{1}{3}\right\rangle,\left\langle\frac{2}{3},-\frac{1}{3}, \frac{2}{3}\right\rangle \text { and }\left\langle\frac{2}{3}, \frac{2}{3},-\frac{1}{3}\right\rangle .
$$

2. (a) Find the equation of the sphere passing through ( $1,0,0$ ), $(0,1,0),(0,0,1)$ and whose centre lies on the plane $3 x-y+z=2$.
(b) Find the centre and radius of the circle given by $x^{2}+y^{2}+z^{2}=49,2 x+3 y+6 z=14$
3. (a) Show that the plane $2 x-2 y+z+12=0$ touches the sphere $x^{2}+y^{2}+z^{2}-2 x-4 y+2 z=3$ and find the point of contact.
(b) Find the equation of the tangent planes to sphere $x^{2}+y^{2}+z^{2}+6 x-2 z+1=0$ which pass through the lines $x+z-16=0,2 y-3 z+30=0$.
4. (a) Find the equation of right circular cylinder of radius 3 and having for its axis the line :

$$
\frac{x-1}{2}=\frac{y-3}{2}=\frac{5-z}{7}
$$

(b) Find the equation of cylinder whose generatixes are parallel to the line $\frac{x-1}{2}=\frac{y+1}{-2}=\frac{z-3}{4}$ and whose guiding curve is the parabola $x^{2}+2 y=0, z=0$.
5. (a) Find the equation of the right circular cone whose vertex is at the point $(2,1,-3)$, semivertical angle $30^{\circ}$ and the

## direction cosines of whose axis are 3:4:-1.

(b) Find the equation of the quadric cone which passes through the three coordinates axes and the three mutually perpendicular lines $\frac{x}{1}=\frac{y}{-2}=\frac{z}{3}$,
$\frac{x}{1}=\frac{y}{-1}=\frac{z}{-1}, \frac{x}{5}=\frac{y}{4}=\frac{z}{1}$.
6. (a) Find the equation of the cone whose vector is $(2,-3,1)$ and whose guiding curve is $4 \mathrm{x}^{2}+\mathrm{y}^{2}=1, \mathrm{z}=0$.
(b) Find the equation of the cone circumscribing the sphere $x^{2}+y^{2}+z^{2}+2 x-2 y-2=0$ and having its vertex at (1, 1, 1).
7. (a) Prove that the equation $4 x^{2}-y^{2}+2 z^{2}+2 x y-3 y z+12 x$ $-11 y+6 z+y=0$ represents a cone whose vector is $(1,2,3)$.
(b) Find the lines in which the plane $x-2 y-z=0$ cuts the cone $3 x^{2}+4 y^{2}-z^{2}=0$. Find the angle between them.
8. (a) Show that the equation $x^{2}+y^{2}+z^{2}-6 y z-2 z x-2 x y$ $-6 x-2 y-2 z+2=0$ represents a hyperboloid of two sheets.
(b) Reduce the equation
$6 y^{2}-18 y z-6 z x+2 x y-9 x+5 y-5 z+2=0$
to the standard form.

