Roll No. ....

(12/24)

5161

B.A.-B.Ed./B.Sc.-B.Ed. (4 Years) (For Batch 2011 & Onwards)/B.A./ B.A.(Hons.)/B.Sc. (First Semester) (For Batch 2011 to 2023 Only)

EXAMINATION

MATHEMATICS

BM-113

Solid Geometry

Time : Three Hours *Maximum Marks :* {B.Sc. : 40, B.A. : 27}

Note : Attempt *Five* questions in all, selecting *one* question from each Unit and the compulsory question. Marks are indicated alongwith questions.

Compulsory Question

1. (a) Define Confocal Parabolas. 1½(1)

(b) To find the equation of the sphere, passing through four given points (x_1, y_1, z_1), (x_2, y_2, z_2), (x_3, y_3, z_3) and (x_4, y_4, z_4). 1½,(1)

(c) Explain Enveloping Cylinder. 1½,(1)

(d) To find the equation of the normal at the point (x_1, y_1, z_1) of the ellipsoid : 1½,(1)

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=.1$$

(e) To prove that one conicoid confocal with a given conicoid, touches a plane. 2,(1)

Unit I

2. (a) Find the latus rectum, equation of axis, tangent at the vertex and vertex of the parabola : 4(3)

$$25x^2-120xy+144y^2-2x-29y-1=0$$

(b) Prove that the conics $x^2+3y^2-1=0$ and $2x^2+12xy+39y^2-2x-12y=0$. 4(2½)

3. Trace the conic :

$$2x^2+3xy-2y^2-7x+y-2=0$$

and calculate the eccentricity of conic. 8(5½)

Unit II

4. (a) Find the equations of the sphere which pass though the circle $x^2+z^2-2x+2z=2$, $y=0$ and touch the plane $y-z=7$.

(b) Two spheres of radii r_1 and r_2 cut orthogonally. Prove that the radius of the common circle is $\frac{r_1 r_2}{\sqrt{r_1^2+r_2^2}}$. 4(2½)

5. (a) Prove that :

$$ax^2+by^2+cz^2+2ux+2vy+2wz+d=0$$

represents a cone if $\frac{u^2}{a}+\frac{v^2}{b}+\frac{w^2}{c}=d$.

4(3)

(b) Find the equation of the right circular cylinder of radius 3 and axis as the line $\frac{x-1}{2}=\frac{y}{2}=\frac{z-3}{1}$. 4(2½)

Unit III

6. (a) Prove that six normals can be drawn from a given point to the ellipsoid. 4(3)

(b) Prove that the central section of an ellipsoid whose area is constant touches a cone of second degree. 4(2½)

7. The normal at any point P of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ meets the principal planes in G_1, G_2, G_3. Show that :

(i) $PG_1 : PG_2 : PG_3 = a^2 : b^2 : c^2$

(ii) $PG_1^2+PG_3^2+PG_3^2=k^2$

find the locus of P. 8(5½)

Unit IV

8. Find the equations to the generating lines of the hyperboloid $\frac{x^2}{4}+\frac{y^2}{9}-\frac{z^2}{16}=1$, which pass through the point (2, 3, –4) and $\left(2,-1,\frac{4}{3}\right)$.

9. Reduce the equation $11x^2+10y^2+6z^2-8yz+4zx-12xy+72x-72y+36z+150=0$ to the standard form and show that it represents an ellipsoid and find the equations of the axes.

8(5½)