

May 2023

**B.Sc. (H) Mathematics (Re-Appear) - IV SEMESTER**  
**Analytical Geometry (BMH-401)**

Time: 3 Hours

Max. Marks:75

- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
  2. Answer any four questions from Part -B in detail.
  3. Different sub-parts of a question are to be attempted adjacent to each other.

**PART -A**

- Q1 (a) Find the eccentricity of the ellipse  $3x^2 + 2y^2 = 1$ . (1.5)
- (b) Write the equation of the tangent to the curve  $ax^2 + 2hxy + by^2 = 0$  at the point  $(-1, -2)$ . (1.5)
- (c) Find the cartesian coordinates of the point whose polar coordinates are  $(2, \frac{\pi}{4})$ . (1.5)
- (d) Find the nature of the conic  $\frac{1}{r} = 1 - 2 \cos \theta$ . (1.5)
- (e) What is great circle? (1.5)
- (f) Define enveloping cone. (1.5)
- (g) Write the general equation of an elliptic paraboloid. (1.5)
- (h) Write the equation of the director circle of the conic  $x^2 + y^2 = 1$  at the point  $(1, -1)$ . (1.5)
- (i) What is chord of contact of a conic? (1.5)
- (j) Write the general equation for  $x$  axis in  $xyz$  system. (1.5)

**PART -B**

- Q2 (a) Find the coordinates of the center of the conic (7)  
 $2x^2 - 72xy + 23y^2 - 4x - 28y - 48 = 0$
- (b) Trace the following conic and reduce it to the canonical form (8)  
 $36x^2 + 24xy + 29y^2 - 72x + 126y + 81 = 0$
- Q3 (a) Find the equations of the tangent and normal to the parabola  $y^2 = 9x$  at the point  $(1, -3)$ . (7)
- (b) Find the equation of the sphere on the join of  $(-1, 3, 2)$  and  $(5, 7, -6)$  as diameter. Find its center also. (8)
- Q4 (a) Find the equation of the cone whose vertex is the origin and base is the circle (7)  
 $x^2 + z^2 = b^2, y = a$
- (b) The section of a cone whose vertex is P and guiding curve is the ellipse (8)  
 $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, z = 0$  by the plane  $x = 0$  is a rectangular hyperbola. Find the locus

of P.

- Q5 (a) Find the equation of the enveloping cone of the sphere  $x^2 + y^2 + z^2 - 2x + 4z = 1$  at the origin. (7)
- (b) Find the equation of the cylinder whose generators are parallel to the  $x$ -axis and passing through the curve  $ax^2 + by^2 + cz^2 = 1, lx + my + nz = p$ . (8)
- Q6 (a) Find the equation of the tangent plane to the surface  $ax^2 + by^2 + cz^2 = 1$  which are parallel to the plane  $lx + my + nz = 0$ . (7)
- (b) Find the condition that the plane  $lx + my + nz = 1$  touches the ellipsoid  $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ . (8)
- Q7 (a) Find the equation of the right circular cylinder whose axis is  $x = 2y = -z$  and radius is 4. (7)
- (b) Show that the equations  $\frac{l}{r} = 1 + e \cos \theta$  and  $\frac{l}{r} = -1 + e \cos \theta$  represent the same conic. (8)