

Roll No. ....

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**1002/MJ**

**F-7/2051**

**GEOMETRY**

Paper–CSM-122

Semester–II

Time allowed : 3 Hours] [Maximum Marks : 45

**Note:** The candidates are required to attempt two questions each from Section A and B carrying 6 marks each and the entire Section C consisting of 7 questions carrying 3 marks each.

**SECTION-A**

1. Transform the equation  $x^2 - 2xy + y^2 + x + y = 0$  to an equation in which  $xy$  term is absent. 6
2. (a) Prove that the locus of the middle points of a system of parallel chords of a parabola is a straight line parallel to the axis. 4

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(b) Find the polar equation of a circle whose centre is  $(1, 1/4)$  and radius 2. 2

3. Find the equation of the chord of contact to tangents drawn from the point  $(r_1, \theta_1)$  to the conic  $\frac{l}{r} = 1 - e \cos \theta$  6
4. Find the length of the semi diameter to the diameter  $y = 3x$  of the ellipse  $9x^2 + 4y^2 = 36$ . 6

**SECTION-B**

5. Find the equation of reciprocal cone of the given equation of the cone :  $2x^2 + 3y^2 + 4z^2 + 2yz + 4zx + 6xy = 0$ . 6
6. Find the equation of the sphere through the points  $(0, 0, 0)$ ,  $(0, 1, -1)$ ,  $(-1, 2, 0)$  and  $(1, 2, 3)$ . 6
7. Find the equation of the right circular cylinder whose generating circle is  $x^2 + y^2 + z^2 = 9$ ,  $x - y + z = 3$ . 6
8. Reduce  $x^2 + 3y^2 + 3z^2 - 2yz - 2x - 2y + 6z + 3 = 0$  to the standard form and prove that it represents an ellipsoid. 6

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**SECTION-C**

9. (i) Find the real central circular reaction of the conicoids :

$$3x^2 + 5y^2 + 3z^2 + 2xz = 4. \quad 3$$

- (ii) Find the points of intersection of the line :

$$\frac{x+5}{-3} = \frac{y-4}{1} = \frac{z-11}{7} \text{ with the hyperboloid}$$

$$12x^2 - 17y^2 + 7z^2 = 7. \quad 3$$

- (iii) Show that the plane  $2x - xy + z = 12 = 0$  touches the sphere :

$$x^2 + y^2 + z^2 - 2z - 4y + 2z = 3. \quad 3$$

- (iv) Find the co-ordinates of the point on transferring the origin to which the equation  $x^2 + 3xy + 4y^2 - 4x - 6y + 5 = 0$  does not contain linear terms in  $x$  and  $y$ . Also find the new equation. 3

- (v) Find the equation of the tangent at the points of the parabola  $y^2 = 8x$  whose ordinate is 4. 3

- (vi) If  $e$  and  $e'$  are eccentricities of a hyperbola and of the conjugate hyperbola, then show that :

$$\frac{1}{e^2} + \frac{1}{e'^2} = 1 \quad 3$$

- (vii) (a) Define rectangular hyperbola. 1

- (b) What is the condition that two spheres :

$$x^2 + y^2 + z^2 + 2u_1x + 2v_1y + 2w_1z + d_1 = 0$$

and

$$x^2 + y^2 + z^2 + 2u_2x + 2v_2y + 2w_2z + d_2 = 0$$

are orthogonal?