

Reg. No. : .....

Name : .....

I Semester B.Sc. Honours in Mathematics (C.B.C.S.S. – Supplementary/  
Improvement) Examination, November 2022  
(2016-2020 Admissions)  
**BHM 105 : TWO DIMENSIONAL GEOMETRY**

Time : 3 Hours

Max. Marks : 60

## SECTION – A

Answer any 4 questions out of 5 questions. Each question carries 1 mark :

1. Transform to parallel axes through the point (3, 5) the equation  $x^2 + y^2 - 6x - 10y - 2 = 0$ .
2. Find the distance between the points (5, 1) and (6, 0).
3. Define parabola.
4. Define conjugate hyperbola.
5. Define auxiliary circle of an ellipse.

## SECTION – B

Answer any 6 questions out of 9 questions. Each question carries 2 marks :

6. Show that the two lines represented by  $x^2(\tan^2\theta + \cos^2\theta) - 2xy \tan\theta + y^2 \sin^2\theta = 0$  make angles  $\alpha, \beta$  with x axis such that  $\tan \alpha - \tan \beta = 2$ .
7. Find the value of  $\lambda$  so that the equation  $2x^2 + xy - y^2 - 11x - 5y + \lambda = 0$  may represent a pair of lines.
8. Find the equation of the parabola with vertex (-1, -2), axis parallel to y-axis and passing through (3, 6).

P.T.O.

K22U 3451

-2-

9. Find the locus of the foot of the perpendicular drawn from the vertex on a tangent to the parabola  $y^2 = 4ax$ .
10. Prove that if tangents be drawn to the parabola  $y^2 = 4ax$  from a point on the line  $x + 4a = 0$ , their chord of contact will subtend a right angle at the vertex.
11. Find the equation of the ellipse whose eccentricity is  $\frac{1}{2}$ , focus is (-1, 1), directrix is  $x - y + 3 = 0$ .
12. Identify the conic  $2x^2 - 3xy + 5y^2 + 6x - 3y + 5 = 0$ .
13. Find the centre of the conic  $14x^2 - 4xy + 11y^2 - 44x - 58y + 71 = 0$ .
14. Find the equation of an asymptote of the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ .

## SECTION – C

Answer any 8 questions out of 12 questions. Each question carries 4 marks :

15. Find the equation of the pair of lines through the origin which represents the lines perpendicular to the pair of lines  $ax^2 + 2hxy + by^2 = 0$ .
16. Find the equation of the pair of lines bisecting the angles between the lines  $ax^2 + 2hxy + by^2 = 0$ .
17. If the chord joining 2 points whose eccentric angles are  $\alpha$  and  $\beta$  on the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  cuts the major axis at a distance d from the centre. Show that  $\tan \frac{\alpha}{2} \tan \frac{\beta}{2} = \frac{d-a}{d+a}$ .
18. Prove that product of perpendiculars from any point of the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  to the two asymptotes is equal to  $\frac{a^2 b^2}{a^2 + b^2}$ .
19. If e, e' be the eccentricities of a hyperbola and of the conjugate hyperbola respectively. Prove that  $\frac{1}{e^2} + \frac{1}{e'^2} = 1$ .
20. Find the vertex, focus, directrix and length of latus rectum of the parabola  $5x^2 + 24y = 0$ .

K22U 3451

-3-

K22U 3451

21. Prove that the locus of the poles of tangents to the parabola  $y^2 = 4ax$  with respect to the circle  $x^2 + y^2 - 2ax = 0$  is the circle  $x^2 + y^2 - ax = 0$ .
22. Derive the polar equation of a conic with focus at the pole.
23. Identify the conic and write the equation of the directrix whose polar equation is  $r = \frac{1}{1 + \cos\theta}$ .
24. P(x, y) is equidistant from the points A (2,3) and B(3, -1). Find the equation of the locus of P.
25. Determine the equation of the curve  $4x^2 - 11xy + 6y^2 = 0$  when the axes are rotated through the acute angle whose tangent is  $\frac{4}{3}$ .
26. Find the general equation of a parabola whose focus is  $(\alpha, \beta)$  and directrix is  $ax + by + c = 0$ .

## SECTION – D

Answer any 2 questions out of 4 questions. Each question carries 6 marks :

27. Trace the conic  $9x^2 + 24xy + 16y^2 - 2x + 14y + 1 = 0$ .
28. The co-ordinate axes are to be rotated through an angle  $\alpha$  to produce an equation for the curve  $2x^2 + \sqrt{3}xy + y^2 - 10 = 0$  that has no cross product term. Find  $\alpha$  and the new equation and identify the curve.
29. Find the equation of tangent to a parabola  $y^2 = 4ax$  at a point on it.
30. Derive the equation of director circle of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ .