K24U 4134

Reg. No. : .....

Name : .....

First Semester B.Sc. Honours in Mathematics (C.B.C.S.S. – OBE – Supplementary/Improvement) Examination, November 2024
(2021 to 2023 Admission)
Core Course
1B04 BMH : TWO DIMENSIONAL GEOMETRY

Time : 3 Hours Max. Marks : 60

PART – A

Answer **any 4** questions. **Each** question carries **1** mark : **(4×1=4)**

1. Write the parametric equation of the ellipse.
2. Define the auxiliary circle.
3. Define the translation of axes.
4. Write the equation of the tangent line to the parabola $y^2 = 4ax$.
5. Define the conjugate hyperbola.

PART – B

Answer **any 6** questions. **Each** question carries **2** marks : **(6×2=12)**

6. Find the equation of the curve $2x^2 - 3y^2 + 4x - 2y + 8 = 0$ referred to a new origin at the point (1, 2).
7. Find the equation of the locus of the point P such that it is equidistant from the point A(2, 0) and y – axis.
8. Find the locus of middle points of chords of the parabola $y^2 = 4ax$ which passes through the point (h, k).
9. Define asymptote and what is the equation of asymptote of the hyperbola.

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10. The normal at a point t_1 on the parabola $y^2 = 4ax$ meets its again at t_2. Prove that $t_2 = -t_1 - \frac{2}{t_1}$.
11. Find the condition for $lx + my + n = 0$ to be a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
12. Find the polar equation of a conic, the focus being at the pole.
13. What is the angle between the lines given by the equations $ax^2 + 2hxy + by^2$?
14. Find the equation of the parabola whose focus (0, 2) and directrix is $y + 1 = 0$.

PART – C

Answer **any 8** questions. **Each** question carries **4** marks : **(8×4=32)**

15. Derive the standard equation of the hyperbola.
16. Find the vertex, focus, directrix and length of the latus rectum of the parabola $8x^2 - 24y = 0$.
17. Find the condition that the line $y = mx + c$ becomes tangent to the parabola $y^2 = 4ax$.
18. Prove that the line $lx + my + n = 0$ touches the parabola $y^2 = 4ax$ if $ln = am^2$.
19. Prove that the polar of the focus of a parabola is the directrix.
20. Find the locus of the middle points of chords of the parabola $y^2 = 4ax$ which passes through the fixed point (h, k).
21. Prove that the semi-latus rectum is a harmonic mean between the segments of any focal chord of a parabola.
22. Find the equation of the chord joining two points whose ecentric angles are given.
23. Find the polar equation of the hyperbola with center as pole.
24. Plot the locus of the equation $x^2 + y^2 - 8x - 10 = 0$.
25. Find the asymptotes of the conic whose equation is $x^2 - 3xy + y^2 + 10x - 10y + 21 = 0$.
26. What conics do the following equation represent and find its centre $12x^2 - 23xy + 10y^2 - 25x + 26y = 14$.

PART – D

Answer **any 2** questions. **Each** question carries **6** marks : **(2×6=12)**

27. Trace the conic $9x^2 + 24xy + 16y^2 - 2x + 4y + 1 = 0$.
28. Prove that the tangents at the extremities of a focal chord of a parabola intersect at right angles on the directrix.
29. Prove that the locus of the poles of normal chords of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is the curve $\frac{a^2}{x^2} + \frac{b^2}{y^2} = (a^2 - b^2)^2$.
30. Prove that the line $lx + my + n = 0$ is a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ if $a^2l^2 + b^2m^2 = n^2$.