Reg. No. : ..................................

Name : ...................................

First Semester B.Sc. Hon's (Mathematics) Degree (Reg./Supple./Improve)
Examination, November 2020
(2016 Admission Onwards)
**BHM105 : TWO DIMENSIONAL GEOMETRY**

Time : 3 Hours

Max. Marks : 60

### SECTION – A

(Answer **any 4** questions out of **5** questions. **Each** question carries 1 mark.) **(4×1=4)**

1. Find the distance between (2, 3) and (4, −1).

2. Define hyperbola.

3. The tangent and the normal at any point of an ellipse bisects the angle between the _____ to that point.

4. Give a parametric representation for the hyperbola.
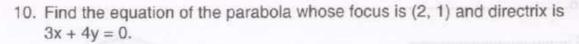
5. Define conic section.

### SECTION – B

(Answer **any 6** questions out of 9 questions. **Each** question carries 2 marks.) **(6×2=12)**

6. Find the co-ordinate of the point which divides the straight line joining the points (−7, 3) and (2, −4) in the ratio 4 : 5.

7. Find the angle through which the axes be rotated so that the expression $3x^2 + 4xy - y^2$ may become of the form $a'x'^2 + b'y'^2$.

8. Form the equation which represent the pair of lines $3x - y = 0$, $x + 3y = 0$.

9. Find the value of $\lambda$ so that the equation $x^2 + 8xy + y^2 + 16x + 4y + 4 = 0$ may represents the pair of lines.

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10. Find the equation of the parabola whose focus is (2, 1) and directrix is $3x + 4y = 0$.

11. Find the equation of an ellipse referred to its axes as coordinate axes, whose eccentricity is $\frac{1}{2}$ and focii are $\left(\pm\sqrt{2}, 0\right)$.

12. For the hyperbola $-8y^2 + 2x^2 = 16$, find the asymptotes.

13. Define rectangular hyperbola and find its eccentricity.

14. Write the polar equation of a conic and hence of a parabola.

## SECTION – C

(Answer **any 8** questions out of 12 questions. **Each** question carries 4 marks.) (8×4=32)

15. Find the lengths of the sides of the triangle whose vertices are (5, 1), (–3, 7), (8, 5) and prove that one of the angle is a right angle.

16. What does the equation $4x^2 + 2\sqrt{3}xy + 2y^2 = 1$ become when the axes are turned through an angle of 30°?

17. What does the equation $(x - a)^2 + (y - b)^2 = c^2$ become when it is transferred to parallel axes through the point $(a - c, b)$?

18. For what values of $\lambda$ does the equation $12x^2 + 7xy + \lambda y^2 + 13x - y + 3 = 0$ represent a pair of lines and what is then the angle between them?

19. Find the eccentricities, focii, directricess and latus recta of the ellipse $4x^2 + 9y^2 = 144$.

20. Find the locus of point of intersection of normals at the end of a focal chord of the parabola $y^2 = 4ax$.

21. From a point on the circle $x^2 + y^2 = a^2$, tangents are drawn to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. Prove that the locus of the midpoints of the chords of contact is $\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right)^2 = \frac{x^2 + y^2}{a^2}$.

22. Prove that four normals can be drawn to the hyperbola $xy = c^2$ from any given point.

23. Find the centre of the conic $3x^2 - 5xy + 6y^2 + 11x - 17y + 13 = 0$.

24. Prove that the semi latus rectum is a harmonic mean between the segments of any focal chord of a parabola.

25. Find the equation of the asymptotes of the conic $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$.

26. Find the equation of the tangent to the parabola $y^2 = 4ax$ which makes an angle θ with its axis.

## SECTION – D

(Answer **any 2** questions out of 4 questions. **Each** question carries 6 marks.) (2×6=12)

27. Prove that the lines joining the origin to the points of intersection of the two curves $ax^2 + 2hxy + by^2 + 2gx = 0$ and $a'x^2 + 2h'xy + b'y^2 + 2g'x = 0$ will be at right angles to one another if $g'(a + b) = g(a' + b')$.

28. Find the equation of the parabola whose focus is $(\alpha, \beta)$ and equation of the directrix is $ax + by + c = 0$.

29. Prove that the equation of a diameter of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $y = -\frac{b^2}{a^2 m}x$.

30. Find the eccentricity of a conic section whose equation is $ax^2 + 2hxy + by^2 = 1$.