

Subject: Mathematics

Course No and Title: MMTC2422M/ Geometry

Time: 2.15 hours

Max Marks:100

Min. Marks:40

Section A: Objective Type Questions**Q1. Choose the appropriate Answer: (8x1.5=12)**

- i. The coordinates of focus of the parabola $x^2 = 4ay$ are
 A (a, o) B $(0, a)$
 C $(4a, o)$ D $(0, 4a)$
- ii. The parametric coordinates of any point on $y^2 = 4ax$ are
 A $(at^2, 2at)$ B $(at, 2at)$
 C $(2at, at^2)$ D $(2at^2, at)$
- iii. The length of latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is
 A $\frac{2b}{a}$ B $\frac{2a^2}{b}$
 C $\frac{b^2}{a}$ D $\frac{2b^2}{a}$
- iv. The eccentricity e of an ellipse is
 A $= 1$ B < 1
 C > 1 D ≥ 1
- v. Equation of hyperbola with asymptotes as axes is
 A $xy = c^2$ B $xy = c$
 C $y = xc^2$ D $x = yc^2$
- vi. Eccentricity of a rectangular hyperbola is
 A 1 B 2
 C $\sqrt{2}$ D $\sqrt{3}$
- vii. The equation of cone with vertex at origin is a homogenous equation of degree
 A 1 B 2
 C 3 D 4
- viii. The lines on the surface of the cone through its vertex are called
 A Generators B Straight lines
 C Guiding curves D Axes

Section-B: Descriptive Type Questions (Short Type)**Q2: Answer all the Questions****(8 x 4 =32)**

- i. Show that the line $y = 3x + \frac{1}{6}$ touches the parabola $y^2 = 2x$
- ii. Find the length and coordinates of latus rectum of the parabola $y^2 = 4x$.
- iii. Find the eccentricity of an ellipse if its latus rectum is equal to one half of its minor axes.
- iv. Define conjugate and equi-conjugate diameters of an ellipse.
- v. Find the length of latus rectum of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.
- vi. Define rectangular and conjugate hyperbola.
- vii. State the necessary and sufficient condition for a curve to have three mutually perpendicular generators.
- viii. Define cone, vertex of cone and guiding curve of cone.

Section – C: Descriptive Type Questions (Medium Type)**Answer all the questions:****(4 x 7=28)**

- Q 3.** Find the equation of tangent and normal to the parabola $y^2 = 9x$ at the point (4, 6).

OR

Prove that only two tangents can be drawn from an external point to a parabola.

- Q 4.** Find the pole of the line $lx + my + n = 0$ with respect to ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

OR

Find the equation of tangent and normal to the ellipse $4x^2 + 9y^2 = 20$ at the point (1, 4/3)

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- Q 5.** Find the equation of hyperbola with foci (2, 0) and (-2, 0) and eccentricity $\frac{3}{2}$.

OR

Prove that if e and e' are the eccentricities of a hyperbola and its conjugate, then $\frac{1}{e^2} + \frac{1}{e'^2} = 1$.

- Q6.** Find the equation of the cone whose vertex is the point (α, β, γ) and whose guiding curve is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, z = 0$,

OR

Find the equation of cone with vertex at origin and which passes through $x^2 + y^2 = 4, z = 2$.

Section – D: Descriptive Type Questions (Long Type)

Answer any two of the following: (2 x 14=28)

- Q 7.** Define Parabola and find the equation of parabola whose focus is (-3,0) and directrix is $x + 5 = 0$
- Q 8.** Find the equation of ellipse in standard form.
- Q 9.** Find the equation of tangent and normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at any point (x_1, y_1)
- Q10.** Find the condition that the general equation of second degree should represent a cone