LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

SECOND SEMESTER – **APRIL 2025**

UMT2MC01 – ANALYTICAL GEOMETRY AND TRIGONOMETRY

Date: 25-04-2025 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

		SECTION A - K1& K2 (CO1)
Q.No	Levels	**Answer ALL the Questions** **(10 x 2 = 20)**
1	K1	Define an asymptote of the hyperbola.
2		Write the polar of (x_1, y_1) with respect to the hyperbola.
3		Find the equation of the sphere with centre (1,-1,2) and radius 3.
4		Find the centre and radius of the sphere $x^2+y^2+z^2-2x-3y+4z+5=0$.
5		Write the condition for the general equation of 2nd degree to represent a cone.
6	K2	What is right circular cylinder?
7		If $x = cos\theta + isin\theta$, write the expansion of $x^4 - \frac{1}{x^4}$.
8		Write the expansion for $cosn\theta$.
9		Express three results of relations between circular and hyperbolic functions.
10		Write the formula for $sinh^{-1}x, tanh^{-1}x$.
		SECTION B– K3& K4 (CO2)
		Answer ALL the Questions **(4 x 10 = 40)**
11	K3	Obtain the asymptotes of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. **[OR]**
12		Find the pole of lx+my+n=0 with respect to $xy = c^2$ and deduce the condition for lx+my+n=0 and $l'x + m'y + n' = 0$ to be conjugate lines.
13		Obtain the equations of the tangent planes to the sphere $x^2+y^2+z^2+2x-4y+6z-7=0$ which passes through the line 6x-3y-2z=0=3z+2. **[OR]**
14		Justify that the plane 4x-3y+6z-35=0 is a tangent plane to the sphere $x^2+y^2+z^2-y-2z-14=0$ and find the point of contact.
15	K4	Prove that the equation $2x^2+2y^2+7z^2-10yz-10zx+2x+2y+26z-17=0$ represents a cone whose vertex is (2,2,1). **[OR]**
16		Determine the equation of the right circular cylinder of radius 3 with axis as $\frac{x-1}{2} = \frac{y-3}{2} = \frac{z-5}{2}$.
17		Express $\frac{sin7\theta}{sin\theta}$ as a polynomial in (i) $cos\theta$, (ii) $sin\theta$. [OR]
18		If $Sin(A+iB) = x+iy$ justify that (i) $x = sinAcoshB$ (ii) $\frac{x^2}{sin^2\theta} - \frac{y^2}{cos^2\theta} = 1$ (iii) $\frac{x^2}{cosh^2\theta} - \frac{y^2}{sinh^2\theta} = 1$.

SECTION C – K5 & K6 (CO3)		
	Answer ALL the Questions	**(2 x 20 = 40)**
19	K5	Determine the equation of the sphere which pass through the circle $x^2+y^2+z^2=5$, $x+2y+3z=5$ and touch the plane $4x+3y=15$.
		[OR]
20		(a) Prove that $\frac{cos7\propto}{cos\propto} = 64cos^6 \propto -112cos^4 \propto +56cos^2 \propto -7$.
		(b) Expand $\sin^3\theta\cos^5\theta$ in a series of sines of multiples of θ. **(10+10)**
21	K6	Explain cylinder and derive the equation of a cylinder with a given generator and a given guiding curve. Also deduce the equation of the sphere when the generators are parallel to z-axis.
		[OR]
22		(a) If $tan\frac{\alpha}{2} = tanh\frac{u}{2}$, then show that $sinhu = tan \propto$ and $u = logtan\left(\frac{\pi}{4}+\frac{\propto}{2}\right)$.
		(b) Obtain real and imaginary parts of $tan^{-1}(x+iy)$. **(10+10)**

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