LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2013**

MT 1503 – ANALYTICAL GEOMETRY OF 2D, TRIG. & MATRICES

Date : 14/11/2013 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

PART – A

Answer **ALL** questions: (10 x 2 = 20)

1. Give the expansion of cos 6θ.
2. Expand sin 5θ in terms of cosθ and sin θ.
3. Give the formula for sinh(x + y).
4. Give the values of Log(x + iy).
5. State Cayley Hamilton theorem.
6. What are characteristic roots and vectors of a matrix.
7. Find the vertex, focus and directrix of the parabola $y^2 = 8x$.
8. Define conjugate diameters of an ellipse.
9. Define rectangular hyperbola.
10. Define polar equation of a conic.

PART – B

Answer any **FIVE** questions: (5 x 8 = 40)

11. Prove that 32 $\cos^6\theta = \cos 6\theta + 6\cos 4\theta + 15\cos 2\theta + 10$.
12. If $\frac{\sin x}{x} = \frac{863}{864}$, find an approximate value of *x*.
13. Separate tanh (x + iy) into real and imaginary parts.
14. Find the value of $Log\left(\frac{1+\cos\theta + i\sin\theta}{\cos\theta - 1 + i\sin\theta}\right)$.
15. Determine the characteristic roots of the matrix $\begin{pmatrix} 0 & 1 & 2 \\ 1 & 0 & -1 \\ 2 & -1 & 0. \end{pmatrix}$
16. Find the locus of poles of chords of the parabola which subtend a right angle at the vertex.
17. Prove that any two straight lines through the points of intersection of an ellipse with any circle make equal angles with the axes of the ellipse.
18. Show that the asymptotes of a rectangular hyperbola are at right angles.

PART – C

Answer any **TWO** questions: (2 x 20 = 40)

19. a) Expand $\sin^3\theta\cos^4\theta$ in terms of sines of multiples of θ.

    b) Show that $128\sin^8\theta = \cos 8\theta - 8\cos 6\theta + 28\cos 4\theta - 56\cos 2\theta + 35$.

20. a) Express $\sinh^{-1}x$ asa logarithmic function.

    b) Prove that $i^i = e^{-(4n+1)\pi/2}$ where n is an integer.

21. Diagonalise $A = \begin{pmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$.

22. a) Find the polar of the point (x_1, y_1) with respect to the parabola $y^2 = 4ax$.

    b) Show that the locus of a pole of any tangent to the ellipse with respect to the auxillary circle is a similar concentric ellipse whose major axis is at right angles to that of the original ellipse.

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