LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2018**

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

Date: 31-10-2018   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

SECTION –A

ANSWER ALL THE QUESTIONS: (10 X 2 = 20)

1. What is the expression for $\tan n\theta$ in terms of $tan\theta$.

2. Write the formula for expansions of $cos\theta$ and $sin\theta$.

3. Write the logarithm of $x + iy$ and find the value of $Log(1 + i)$.

4. Prove that $(i) cosh^2 x - sinh^2 x = 1$, (ii) $cosh^2 x + sinh^2 x = cosh 2x$.

5. If A and B are similar matrices then, prove that they have same characteristic equation.

6. State Cayley – Hamilton theorem.

7. Define directrix of the parabola.

8. If the polar of P passes through Q, then prove that the polar of Q passes through P.

9. Define polar co-ordinate.

10. Define polar equation of a conic.

SECTION - B

ANSWER ANY FIVE QUESTIONS: (5 X 8 = 40)

11. Express $\cos 8\theta$ in terms of $\sin \theta$.

12. If $\dfrac{\sin \theta}{\theta} = \dfrac{5045}{5046}$, show that $\theta = 1°58'$ approximately.

13. If $\sin(A + iB) = x + iy$, prove that   (i) $\dfrac{x^2}{\sin^2 A} - \dfrac{y^2}{\cos^2 A} = 1$

   (ii) $\dfrac{x^2}{\cosh^2 B} + \dfrac{y^2}{\sinh^2 B} = 1$

14. Find the general value of $log_{(-3)}(-2)$.

15. Find the eigenvalues of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

16. Find the locus of the poles of all tangents to the parabola $y^2 = 4ax$ with respect to the parabola $y^2 = 4bx$.

17. Find the locus of the mid-point of chords of the parabola which subtend a right angle at the vertex of the parabola.

18. Find the asymptotes of the hyperbola
$3x^2 - 5xy - 2y^2 + 17x + y + 14 = 0.$

SECTION - C

ANSWER ANY TWO QUESTIONS: **(2 X 20 = 40)**

19.a) Express $\frac{sin6\theta}{sin\theta}$ in terms of $cos\theta$.

   b) Expand $sin^3\theta cos^5\theta$ in a series of $sines$ of multiples of θ.**(10+10)**

20. a) Separate into real and imaginary parts of $tan^{-1}(x + iy)$.

   b) Reduce $(\alpha + i\beta)^{x+iy}$ to the form $A + iB$.**(10+10)**

21. Find the diagonalize of the matrix $\begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

22. a) Show that the locus of the intersection of tangents to $y^2 = 4ax$ which intercept a constant length d on the directrix is
$(y^2 - 4ax)(x + a)^2 = d^2x^2.$

   b) Trace the curve $\frac{10}{r} = 3cos\theta + 4sin\theta + 5.$**(10+10)**

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