B.Sc. DEGREE EXAMINATION,NOVEMBER 2018
I Year II Semester
Core Major - Paper III
CLASSICAL ALGEBRA

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Sum the series.
   $\log_3 e - \log_9 e + \log_{27} e - \log_{81} e + ...$
2. Sum the series.
   $1 + \frac{3^2}{2!} + \frac{3^4}{4!} + \frac{3^6}{6!} + ...$
3. Solve $x^4 + 2x^3 - 5x^2 + 6x + 2 = 0$ given that 1 + i is a root
4. Form the cubic equation two of whose roots are 3, $1 + \sqrt{2}$
5. Find the polynomial equation of the least degree having -1,1,2, and 3 as roots.
6. Remove the fractional coefficients from the equation
   $x^3 - \frac{1}{4}x^2 + \frac{1}{3}x - 1 = 0$
7. Define Unitary matrix.
8. Give an example of Skew-Hermittan matrix.
9. Find the number of divisors and sum of all the divisors of 360.
10. Find $\phi(400)$and $\phi(600)$.
11. If $a \equiv b(mod\ m)$and $b \equiv c(mod\ m)$ then prove that $a \equiv c(mod\ m)$
12. Fill in the blank:
    Sum of Eigen value of matrix A = ————————A
    Product of Eigen value of A = ————————A.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Show that
    $\frac{1}{3!} + \frac{2}{5!} + \frac{3}{7!} + \frac{4}{9!} + ... = \frac{1}{2e}$
14. Solve the equation $6x^3 - 11x^2 - 3x + 2 = 0$ whose roots are in harmonic progression.
15. Diminish the roots of the equation
    $x^4 - 4x^3 - 7x^2 + 22x + 24 = 0$ by 1 and hence solve the equation.

16. Find the Eigen values and Eigen vectors of the matrix.
$\begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$
17. Show that 18! + 1 is divisible by 437.
18. Solve the equation $x^3 - 4x^2 - 3x + 18 = 0$ given that two of its roots are equal.
19. Show that the matrix
$\frac{1}{3}\begin{pmatrix} 2 & 2 & 1 \\ -2 & 1 & 2 \\ 1 & -2 & 2 \end{pmatrix}$ is orthogonal.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Sum the series
$\frac{7}{18} - \frac{7.10}{12.24} + \frac{7.10.13}{18.24.30} - \ldots..$
21. If the sum of the two roots of the equation $x^4 + px^3 + qx^2 + rx + s = 0$ equals the sum of the other two, prove that $p^3 + 8r = 4pq$
22. Solve the equation.
$6x^6 - 35x^6 + 56x^4 - 56x^2 + 35x - 6 = 0$
23. Verify Cayley-Hamilton theorem for the matrix given below. Hence find its inverse.
$A = \begin{pmatrix} 2 & -2 & 1 \\ 0 & 1 & 2 \\ 1 & 0 & 1 \end{pmatrix}$
24. Show that if x and y are both prime to the prime number n, then $x^{n-1} - y^{n-1}$ is divisible by n. Hence deduce that $x^{12} - y^{12}$ is divisible by 1365 .

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