



# VIT<sup>®</sup>

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Vellore - 632 014, Tamil Nadu, India.

SCHOOL OF ADVANCED SCIENCES

DEPARTMENT OF MATHEMATICS

## VIT MATHFEST - 2024

### Syllabus for Talent Exam and Quiz - UG Level

#### 1. Matrices

Symmetric - Skew symmetric - Hermitian - Skew Hermitian - Orthogonal and Unitary Matrices - Cayley-Hamilton Theorem (without proof) - Eigen Values - Eigen Vectors- Similar Matrices - Diagonalisation of a Matrix.

#### 2. Summation of Series

Summation of series using Binomial - Exponential and Logarithmic series.

#### 3. Trigonometry

Expansions of  $\cos n\theta$ ,  $\sin n\theta$  - Expansion of  $\tan n\theta$  in terms of  $\tan \theta$  - Expansion of  $\tan(A+B+C+\dots)$  - Formation of Equations.

#### 4. Multivariable Calculus

Functions of two variables- Limits and continuity- Partial derivatives -Total differential- Jacobian and its properties. Taylor's expansion for two variables- Maxima and minima- Constrained maxima and minima- Lagrange's multiplier method.

#### 5. Special Functions and Multiple Integrals

Reduction formulae, Beta and Gamma Functions and its Properties. Evaluation of double integrals- Change of order of integration- Change of variables between Cartesian and polar co-ordinates - Evaluation of triple integrals- Change of variables between Cartesian and Cylindrical and Spherical co-ordinates.

#### 6. Ordinary Linear Differential Equations

Second order non- homogeneous differential equations with constant coefficients- Differential equations with variable coefficients- Method of undetermined coefficients and Method of variation of parameters.

## **7. Laplace Transform**

Definition- Properties of Laplace transform - Laplace transform of standard function  
Laplace transform of periodic functions – Unit step function- Impulse function - Inverse  
Laplace Transform – Partial fraction method- Convolution method.

## **8. Vector Differentiation**

Scalar and vector valued functions – Gradient, Tangent plane– Directional Derivative-  
Divergence and Curl– Scalar and Vector potentials. Statement of vector identities -Simple  
problems.

## **9. Vector Integration**

Line, Surface and Volume integrals - Statement of Green's, Stoke's and Gauss divergence  
theorems - Verification and Evaluation of vector integrals using them.

## **10. Statistics**

Statistics and data analysis- Measure of central tendency- Measure of dispersion-  
Moments- Skewness- Kurtosis.

## **11. Probability**

Random variables- Probability Mass function, distribution and density functions- Joint  
probability distribution and joint density functions; Marginal, Conditional distribution and  
density functions- Mathematical expectation and its properties- Covariance and Moment  
generating function.

## **12. Correlation and Regression**

Correlation and Regression- Rank correlation, Partial and Multiple Correlation- Multiple  
Regression.

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