

# Applied Mathematics – I

F.E. Sem. I

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## EVALUATION SYSTEM

	Time	Marks
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical &amp; Oral Exam</b>	–	–
<b>Oral Exam</b>	–	–
<b>Term Work</b>	–	25

## SYLLABUS

### 1. Complex numbers :

- Review of complex numbers. Cartesian, Polar and Exponential form of a complex number.
- De Moivre's Theorem (without proof). Powers and roots of Exponential and Trigonometric functions.
- Circular and Hyperbolic functions.

### 2. Complex numbers and Successive differentiation :

- Inverse circular and Inverse Hyperbolic Functions. Logarithmic functions.
- Separation of real and imaginary parts of all types of functions.
- Successive differentiation–nth derivative of standard functions –  $e^{ax}$ ,  $(ax + b)^{-1}$ ,  $(ax + b)^m$ ,  $(ax + b)^{-m}$ ,  $\log(ax + b)$ ,  $\sin(ax + b)$ ,  $\cos(ax + b)$ ,  $e^{ax} \sin(bx + c)$ ,  $e^{ax} \cos(bx + c)$ .
- Leibnitz's theorem (without proof) and problems.

### 3. Partial differentiation :

- Partial derivatives of first and higher order, total differential coefficients, total differentials, differentiation of composite and implicit functions.
- Euler's theorem on Homogeneous function with two and three independent Variables (with proof), deductions from Euler's theorem.

### 4. Application of partial differentiation, Mean value theorems :

- Errors and approximations, Maxima and Minima of a function of two independent variables. Lagrange's method of undetermined multipliers with one constraint.
- Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem (all theorems without proof) Geometrical interpretation and problems

### 5. Vector algebra & Vector calculus :

- Vector triple product and product of four vectors.
- Differentiation of a vector function of a single scalar variable. Theorems on derivatives (without proof). Curves in space concept of a tangent vector (without problems)
- Scalar point function and vector point function. Vector differential operator del. Gradient, Divergence and curl–definitions, Properties and problems. Applications – Normal, Directional derivatives, Solenoidal and Irrotational fields.

### 6. Infinite series, Expansion of functions and Indeterminate forms :

- Infinite series–Idea of convergence and divergence. D'Alembert's ratio test, Cauchy's root test.
  - Taylor's theorem (without proof). Taylor's series and Maclurin's series (without proof), Expansion of standard series such as  $e^x$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $\sin hx$ ,  $\cos hx$ ,  $\tan hx$ ,  $\log(1 + x)$ ,  $\sin^{-1}x$ ,  $\tan^{-1}x$ , Binomial series, Expansion of functions in power series.
  - Indeterminate forms  $\frac{0}{0}$ ,  $\frac{\infty}{\infty}$ ,  $0 \times \infty$ ,  $\infty - \infty$ ,  $0^0$ ,  $\infty^0$ ,  $1^\infty$ . L'Hospital's rule – problems involving series also.
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**Reference :**

1. A textbook of Applied Mathematics – (*P.N. and J.N. Wartikar*) Volume 1 and 2, Pune Vidyarthi Griha.
2. Higher Engineering Mathematics – (*Dr. B.S. Grewal*), Khanna Publications.
3. Advanced Engineering Mathematics – (*Erwin Kreyszing*), Wiley Eastern Limited, 8<sup>th</sup> Ed.
4. Vector analysis – (*Murray R., Spiegel*), Schaum series
5. Higher Engineering mathematics – (*B.V. Ramana*), Tata McGraw Hill.

