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11th National Undergraduate Mathematics Olympiad 2019

Modality of the Olympiad

The time allotted for each Regional Olympiad, as well as the Final Round of the Olympiad, is 120 minutes. There will be 10 problems each carrying 10 marks. All questions are to be answered. Contents of the questions will not exceed second year level in mathematics. The problems will be set from among the topics comprising the subject areas listed below.

- 1. Vector and Analytic Geometry:** Vectors in two and in three dimensions. Scalar product. Vector product. General equation of second degree: Conic section. Coordinates in three dimensions: Direction cosines. Planes and straight lines in three dimensions. Applications of geometry.
- 2. Algebra:** Complex numbers. DeMoivre's theorem and applications. Polynomials and algebraic equations. Summation of algebraic and trigonometric series. Basic knowledge of groups, rings and fields. Elementary number theory. Vector spaces. Linear independence: Basis and Dimension. Linear transformations. Linear equations, Matrices and determinants. Applications of Linear Algebra.
- 3. Calculus of One Variable:** Functions and their graphs, limits, continuity, differentiation and application, integration and applications, fundamental theorems and applications. Convergence of infinite sequences and series. Applications of Calculus.
- 4. Calculus of Several Variables:** Differentiation and integration of vector functions. Line, surface and volume integrals. Cylindrical polar and spherical polar coordinates. Applications of Grad, Div and Curl. Theorems of Green, Gauss, Stokes and their applications.
- 5. Differential Equations:** Applications of 1st and 2nd order differential equations. Special functions.

- **Around 70% Questions in the exams of the NUMO 2019 are expected to be from the books listed below and 30% from the attached question bank.**

Reference Books:

1. Calculus – Anton, Bivens and Davis, (10th ed.)
2. Elementary Linear Algebra- Howard Anton and Chris Rorres, (11th ed.)
3. Differential Equations with Modeling and Applications- Dennis G. Zill. (10th ed.)
4. Advanced Mathematics- Erwin Kreyszig, (10th ed.)