

APPENDIX 3: SYLLABUS FOR AEEE 2020

MATHEMATICS

Unit 1: COMPLEX NUMBERS: Complex numbers in the form $a+ib$ and their representation on a plane. Argand diagram. Algebra of complex numbers, Modulus and argument (or amplitude) of a complex number, square root of a complex number. Cube roots of unity, triangle inequality.

Unit 2: PERMUTATIONS AND COMBINATIONS: Fundamental principle of counting; Permutation as an arrangement and combination as selection, simple applications.

Unit 3: BINOMIAL THEOREM: Binomial theorem for positive integral indices. General and middle terms in binomial expansions, simple applications.

SEQUENCES AND SERIES

Arithmetic, Geometric and Harmonic progressions. Insertion of Arithmetic, Geometric and Harmonic means between two given numbers. Relation between A.M., G.M. and H.M. Special series $\sum n$, $\sum n^2$, $\sum n^3$. Arithmetico-Geometric Series, Exponential and Logarithmic Series.

Unit 4: MATRICES AND DETERMINANTS: Determinants and matrices of order two and three, Properties of determinants. Evaluation of determinants. Addition and multiplication of matrices, adjoint and inverse of matrix. Solution of simultaneous linear equations using determinants.

Unit 5: QUADRATIC EQUATIONS: Quadratic equations in real and complex number system and their solutions. Relation between roots and coefficients, Nature of roots, Formation of quadratic equations with given roots;

Unit 6: TRIGONOMETRY: Trigonometrical identities and equations. Inverse trigonometric functions and their properties. Properties of triangles including centroid, incentre, circumcenter and orthocenter, Solution of triangles. Heights and distances.

Unit 7: MEASURES OF CENTRAL TENDENCY AND DISPERSION: Calculation of Mean, Median and Mode of grouped and ungrouped data, Calculation of standard deviation, variance and mean deviation for grouped and ungrouped data.

Unit 8: PROBABILITY: Probability of an event, addition and multiplication theorems of probability and their applications; Conditional probability; Bayes' theorem, Probability distribution of a random variate; Binomial and Poisson distributions and their properties.

Unit 9: DIFFERENTIAL CALCULUS: Polynomials, rational, trigonometric, logarithmic and exponential functions; Graphs of simple functions, Limits, Continuity; Differentiation of the sum, difference, product and quotient of two functions; Differentiation of trigonometric, inverse trigonometric, logarithmic, exponential, composite and implicit functions; Derivatives of order up to two, Applications of derivatives; Maxima and Minima of functions one variable, tangents and normal, Rolle's and Lagrange's Mean Value Theorems.

Unit 10: INTEGRAL CALCULUS: Integral as an anti-derivative. Fundamental integrals involving algebraic, trigonometric, exponential and logarithmic functions; Integration by substitution, by parts and by partial fractions; Integration using trigonometric identities; Integral as a limit of sum; Properties of definite integrals. Evaluation of definite integral;

Determining areas of the regions bounded by simple curves.

Unit 11: DIFFERENTIAL EQUATIONS: Ordinary differential equations, their order and degree; Formation of differential equation; Solutions of differential equations by the method of separation of variables; Solution of Homogeneous and linear differential equations of first order

Unit 12: TWO-DIMENSIONAL GEOMETRY: Review of Cartesian system of rectangular co-ordinates in a plane, distance formula, area of triangle, condition for the collinearity of three points, slope of a line, parallel and perpendicular lines, intercepts of a line on the coordinate axes.

Unit 13: THE STRAIGHT LINE AND PAIR OF STRAIGHT LINES: Various forms of equations of a line, intersection of lines, angles between two lines, conditions for concurrence of three lines, distance of a point from a line. Equations of internal and external bisectors of angles between two lines, equation of family lines passing through the point of intersection of two lines, homogeneous equation of second degree in x and y, angle between pair of lines through the origin, combined equation of the bisectors of the angles between a pair of lines, condition for the general second degree equation to represent a pair of lines, point of intersections and angles between two lines.

Unit 14: CIRCLES AND FAMILY OF CIRCLES: Standard form of equation of a circle, general form of the equation of a circle, its radius and centre, equation of a circle in the parametric form, equation of a circle when the end points of a diameter are given, points of intersection of a line and circle with the centre at the origin and condition for a line to be tangent, equation of a family of circles through the intersection of two circles, condition for two intersecting circles to be orthogonal.

Unit 15: CONIC SECTIONS: Sections of cones, equations of conic sections (parabola, ellipse and hyperbola) in standard forms, conditions for $y = mx+c$ to be a tangent and point(s) of tangency.

Unit 16: VECTOR ALGEBRA: Vector and scalars, addition of two vectors, components of a vector in two dimensions and three-dimensional space, scalar and vector products, scalar and vector triple product. Application of vectors to plane geometry.

Unit 17: THREE-DIMENSIONAL GEOMETRY: Distance between two points. Direction cosines of a line joining two points. Cartesian and vector equation of a line. Coplanar and skew lines. Shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines (ii) two planes (iii) a line and a plane. Distance of a point from a plane.