

M. Tech. (QROR) Admission Test 2024

Syllabus: PQB

PART I: MATHEMATICS

- Quadratic equation. Roots of polynomial. AP, GP, HP. Divisibility and Prime numbers. Binomial theorem.
- Inequalities. Permutation and combination. Complex numbers and De Moivre's theorem.
- Elementary set theory. Functions and relations. Matrices: determinant, rank and inverse, symmetric matrix. Eigen values and eigen vector. System of linear equations.
- Trigonometry: multiple and sub-multiple angles, inverse circular functions, identities, solutions of equations, properties of triangles.
- Coordinate geometry (2-dimensional): straight line, circle, parabola, ellipse and hyperbola. Plane geometry. Mensuration.
- Sequences. Series: convergence and divergence, power series. Limit and continuity of functions of one or more variables. Differentiation and its applications: maxima and minima. Integration: indefinite and definite integrals, area computation. Ordinary and partial differential equations (up to second order).

PART II (SECTION S): STATISTICS-PROBABILITY

Statistics

- Descriptive statistics for univariate, bivariate and multivariate data.
- Standard univariate probability distributions [Binomial, Poisson, Normal] and their fitting, properties of distributions. Sampling distributions.
- Theory of estimation and tests of statistical hypotheses.
- Simple and Multiple linear regression, linear statistical models, ANOVA.
- Principles of experimental designs and basic designs [CRD, RBD & LSD].
- Elements of non-parametric inference.
- Elements of categorical data analysis.
- Sample surveys – simple random sampling with and without replacement, stratified and cluster sampling.

Probability

- Classical definition of probability and standard results on operations with events, conditional probability and independence.

- Distributions of discrete type [Bernoulli, Binomial, Multinomial, Hypergeometric, Poisson, Geometric and Negative Binomial] and continuous type [Uniform, Exponential, Normal, Gamma, Beta] random variables and their moments.
- Bivariate distributions (with special emphasis on bivariate normal), marginal and conditional distributions, correlation and regression.
- Multivariate distributions, marginal and conditional distributions, regression, independence, partial and multiple correlations.
- Order statistics [including distributions of extreme values and of sample range for uniform and exponential distributions].
- Distributions of functions of random variables.
- Multivariate normal distribution [density, marginal and conditional distributions, regression].
- Weak law of large numbers, central limit theorem.
- Basics of Markov chains and Poisson processes.

PART II (SECTION E): ENGINEERING

Engineering Mechanics and Thermodynamics

- Forces in plane and space, analysis of trusses, friction, work-energy principle, moment of inertia, plane motion of rigid bodies, belt drive, gearing, principles of strength of materials, beams, columns.
- Laws of thermodynamics, internal energy, enthalpy, work and heat, reversible changes, adiabatic changes, heat formation - combustion, reaction, solution and dilution, entropy and free energy and maximum work function, reversible cycle and its efficiency, principles of internal combustion engines.

Electrical and Electronics Engineering

- DC circuits, AC circuits (1- ϕ), energy and power relationships, transformer, DC and AC machines, concepts of control theory and applications.
- Network analysis, 2 port network, transmission lines, elementary electronics (including amplifiers, transistors, oscillators, op-amp circuits), analog and digital electronic circuits, basics of computer architecture.

Engineering Drawing

- Concept of orthogonal projection, point projection, line projection, projection of objects, sectional view of simple mechanical objects, isometric view, sketch of machine parts.

(Use of Geometry Box containing Set Square, Compass, Diagonal Scale and Pencil is allowed)