MTech – Biomedical Data Science

Entrance Test Pattern

GENERAL INFORMATION

Duration: 75 minutes Total marks: 60 No. of questions: 60 (Section A: 30, Section B: 30) Type of Questions: MCQs

<u>Syllabus</u>

Section-A

1. Statistics

Probability definition, theorems on probability; set-theoretical approach to probability, Counting methods – permutation and combinations; conditional probability and Bayes theorem; dependence and independence of events; contingency tables; Statistical parameters and their estimation; Mean, Median, Mode, Variance, Standard deviation.

2. Quantitative Aptitude

Numerical computation and estimation; Ratios and Proportions; Percentages; Powers; Exponents and logarithms; Permutations and combinations; Series; Mensuration, Geometry and Trigonometry; Elementary statistics; Probability; Units of Measurement; Linear and Quadratic equations; Binomial theorem; Set theory; Molarity/Normality/percentage solution; Growth rate and mutation rate calculations. Transformation of shapes; Translation and Rotation; Scaling and Mirroring; Assembling and Grouping; Patterns in two and three dimensions; Interpreting the graphs, plots and charts.

Section-B [Any Two Sub Sections]

1. Life Sciences

Central dogma; Replication and repair of DNA; Regulation of transcription and translation in prokaryotes and eukaryotes; Concepts of mole, mole fraction, molarity; Structure of nucleic acids, proteins, carbohydrates and lipids; Enzyme kinetics and inhibition; Allostericity and cofactors; Bioenergetics; Metabolism and its regulation. Biological data types; Analysis of nucleic acid and protein sequences; Sequence Analysis and Phylogeny; Concepts of genomics, transcriptomics, proteomics, and metabolomics. Protein folding/unfolding energetics, inter and intra-molecular interactions in biomolecules, structure determination methods.

2. Mathematics

Sequence and Series: Sequence of real numbers, their convergence, and limits; limits of standard sequences; Summation of series; Tests for convergence and divergence of series Coordinate systems and analytical geometry: Points in two and three-dimensional cartesian coordinate system; distance between points; polar coordinates; circular motion and their projection on axes; equations of lines and planes in three dimensions. Linear and nonlinear functions; polynomial, exponential, logarithmic, trigonometric functions and their graphs.

3. Chemistry

Structure of nucleic acids, carbohydrates, and lipids; Enzyme kinetics and inhibition; Allostericity and cofactors; Bioenergetics; Metabolism and its regulation. Principles and methods of characterization of compounds including mass spectrometry, nuclear magnetic resonance spectroscopy, IR spectroscopy, and UV-VIS spectroscopy. Basics of thermodynamics - thermodynamic systems - reversible and irreversible processes - laws of thermodynamics - energy changes in living systems- free energy, enthalpy, entropy and their relationship - free energy changes in biochemical reactions.