Bio Medical Engineering (BM)

Engineering Mathematics:

Differential and integral calculus. Partial and total differentials. Composite functions. Systems of linear equations. Matrices and determinants, rank, Cramer's rule. Differential equations. Homogeneous and non homogeneous. Power series. Theory of complex variables, Cauchy-Reimann equations. Cauchy's residue theorem. Singular points, evaluation of residues. Probability, Conditional probability, probability density function, mean, median, mode and standard deviation; random variables; Uniform, Normal, Exponential, Poisson and Binomial distributions.

Biomedical Engineering

Bioelectricity: Resting Potential. Action Potential. Nernst Equation. Propagation in myelinated and unmyelinated nerve fibres. Origin of biopotential signals like ECG, EEG, EMG and EOG. Biopotential electrodes. Medical Instrumentation and Equipment: General characteristics of medical instruments. Analytical Instrumentation. ECG, EEG, EMG, Cardiac Pacemaker, Defibrillator, X-ray machine, Hemodialyses, Ventilator, Heart -lung Machine, and Surgical diathermy. Biomechanics and Biomaterials: Mechanical properties of bone and soft tissues. Viscoelasticity. Analysis of forces in skeletal joints. Mechanics of blood flow in the cardiovascular system. Biocompatibility. Characteristics of an ideal biomaterial. Metals, polymers and ceramics. . Biomedical signal processing and Imaging : QRS detection methods. Rhythm analysis. ECG pattern recognition. ECG data compression algorithms. Detection of resting rhythms. Ultrasound, CT, MRI, PET. Techniques of Image enhancement and reconstruction. Biological Control Systems: General features of biological control systems. Regulation of body temperature, blood pressure, and heart rate.

Electronic Engineering

Electronic devices and circuits: p-n junction, BJT, MOSFET characteristics, basic amplifier configurations, biasing of BJT and JFET, difference amplifier, R-C coupled amplifier, frequency response, feedback in amplifiers, power amplifiers, power rectification. Pulse and digital circuits: Linear and non linear wave shaping, sweep circuits, Multivibrators, logic gates Boolean algebra, arithmetic circuits, TTL, MOS, CMOS, flip-flops, counters, shift registers, 8-bit microprocessor architecture, programming and interfacing. Signals and Systems: Representation of continuous and discrete-time-signals; linear, time -invariant and causal systems, Fourier series representation of continuous periodic signals, sampling theorem, Fourier, Laplace and Z-transforms.

Electrical Engineering

Topological description of a network, KVL, KCL, Mesh and nodal analysis. First and second order circuits, RL, RC and RLC circuits. forced and natural response of a network to step, impulse and sinusoidal inputs, Transient and steady state response. Laplace-transform method of solution. Network theorems. Implications of Linearity, Signal analysis, Two port networks. Electrical machines: Single phase transformer, three phase transformers, DC machines-types of winding, generator characteristics. Starting and speed control of motors. Three phase and single phase

induction motors principles Control systems: Principles o f feedback, transfer function, block diagrams, steady-state errors. Stability. Routh and Nyquist techniques.

Electronics and Instrumentation Engineering

Bridges and potentiometers, PMMC, moving iron, dynamo meter and induction type instruments. Measurement of voltage, current, power, energy and power factor. Instrument transformers. Digital voltmeters and multimeters. Phase, time and frequency measurement. Q"meters; oscillo scopes, Potentiometric recorders.

Transducers: Basic requirements, passive and active transducers. Operating principles of transducers for measurement of displacement, temperature, pressure and flow. Signal conditioning circuits. Applications.

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