

MCKV Institute of Engineering
243, G. T. Road (N), Liluah, Howrah -711204

DIAGNOSTIC TEST OF 1ST YEAR STUDENTS
(Academic Session: 2016-2017)

EXAMINATION DETAILS

Date	Day	Stream	Duration
22/08/16	Mon	CSE	3:30 to 4:30 pm
23/08/16	Tue	EE	3:30 to 4:30 pm
24/08/16	Wed	IT	2:40 to 3:40 pm
25/08/16	Thu	ME	3:30 to 4:30 pm
26/ 08/ 16	Fri	ECE	1 to 2 pm
26/ 08/ 16	Fri	AUE	3:30 to 4:30 pm

SYLLABUS

PHYSICS A

Oscillations: Simple Harmonic Motion: Characteristics, Features, Nature of Kinetic Energy and Potential Energy and their interrelation (Conservation of Mechanical Energy), Simple Pendulum, Physical Pendulum etc., Composition of Two SHM, SHM as a projection of circular motion, Damped Oscillation, Forced Oscillation, Resonance.

General Properties of Matter: Elasticity, stress, strain, Hooke's law & the modulus of elasticity, Relation between longitudinal stress & strain, Determination of Young's modulus in laboratory, Viscosity & Poiseuille's equation, Stoke's law.

Physical Optics: Waves or particles, Huygen's principle, Interference of light & Young's double slit experiment, Coherent & Non coherent sources, Diffraction of light, Fraunhofer diffraction by a single slit, Limit of resolution, Resolving power of microscope & telescope, Polarization of Light

Dispersion: Dispersion & Dispersive power, Angle of minimum deviation.

Heat: Definition of Thermal conductivity,. Laboratory determination of thermal conductivity of a good & bad conductor.

PHYSICS B / MECHANICS

Introduction to Engineering Mechanics: Introduction to statics. Concept of particle and rigid body. Force. Types of forces. System of forces. Scalar & Vector. Transmissibility of a force.

Vector: Vectorial representation of forces. Addition of vector. Subtraction of vector. Product of a vector with a scalar quantity. Position vector. Displacement vector.

Two Dimensional Force System: Resolution & composition of concurrent coplanar forces. Equilibrium of system of forces. Moment of a force about a point.

Equilibrium of system of forces: Types of forces on a body. Free body diagram. Equilibrium of two / three force system in two dimension. Equilibrium of rigid bodies (Equilibrium of non concurrent force system).

Friction: Frictional force. Laws of friction. Simple contact friction.

Centrer of Gravity: Determination of areas & volumes. Centre of gravity & centroids. Centroid of a line. First moment of area and centroid. Determination of centroid of simple figures from first principle. Centroid of composite sections.

Moment of Inertia: Moment of Inertia of plane area. Moment of Inertia from first principle. Moment of Inertia of composite sections.

Simple Stress Strain: Stress. Unit of stress. Axial stress. Strain. Stress strain relation. Nominal stress and true stress. Factor of safety. Hooke's law. Shear stress. Simple shear. Poisson's ratio. Volumetric strain. Elastic constants & relation between them.

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PHYSICS C / BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Semiconductors: Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Bipolar Junction Transistors: Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors

Electrical Circuit: Introduction to basic electrical circuit and KVL and KCL laws.

Electromagnetic Theory: Faraday's law, lenz's law, mutual inductance, self inductance, comparison between magnetic and electrical circuit, coefficient of coupling, dynamically and statically induced emfs, Magnetic force between conductors, Magnetic flux density and field intensity, magnetic potential, permeability, leakage flux and flux fringing, eddy current loss. Biot Savart's law and its application for a straight long conductor, Hysteresis loss, ampere circuital law, energy stored in a magnetic field, lifting power of a magnet, Generation of alternating emf, definitions of all ac parameters

R-L-C Circuit: Currents through R, L and C (pure), R-L series circuit response, R-C and R-L-C series circuit responses, R-L-C parallel circuit response, Expression of power through R circuits, Series and parallel resonance & sums

ENGINEERING CHEMISTRY

Concept of Thermodynamic System: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics

Internal energy: Definition, example, characteristics, Physical significance, mathematical expression for change in internal energy for ideal gas.

Enthalpy: Definition, example, characteristics physical significance, mathematical expression for change in enthalpy.

Heat capacity: Definition, classification of heat capacity (C_p and C_v): Definition and general expression of C_p - C_v for ideal gas, relation; adiabatic changes; reversible and irreversible processes;

Application of first law of thermodynamics to chemical processes: Exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchhoff's law

Electrochemical cells: Cell emf and its thermodynamic derivation of the emf of a galvanic cell (Nernst equation); Single electrode potentials and its applications; hydrogen half cell and calomel half cell; quinhydrone half cell and calomel half cell (construction, representation, cell reaction, expression of potential, discussion, application.)

Conductance of electrolytic solutions: Specific conductance, equivalent conductance, molar conductance and ion conductance; effect of temperature and concentration; basic ideas and inter ionic attractions; transport numbers and hydration of ions

Reaction Dynamics: Reaction laws: rate and order; molecularity; first and second order kinetics; mechanism and theories of reaction rates (Transition state theory, Arrhenius equation)

Structure and Reactivity of Organic Molecule: Electro negativity, electron affinity, hybridization, Inductive effect; resonance; hyperconjugation; electrometric effect; carbocation, carbanion and free radicals; brief study of some addition, elimination and substitution reactions.

Polymerization: Concepts, classifications and industrial applications; polymerization processes, degree of polymerization (addition and condensation polymerization); preparation, structure and use of some common polymers: plastic (PE, PP, PVC bakelite), rubber (natural rubber, SBR, NBR), fibre (nylon 6,6, polyester); conducting and semiconducting polymers

MATHEMATICS

Limit & Continuity, Differentiation & Integration, Ordinary Differential Equation, Matrix & Determinant.

ENGLISH

Voice Change, Direct and Indirect Speech, Transformation of Sentences, Articles, Preposition.