DEPARTMENT OF CIVIL ENGINEERING

GUIDE TO LATERAL ENTRY ENTRANCE EXAMINATION (LEET)

LATERAL ENTRY ADMISSION TO THE SECOND YEAR OF UG PROGRAMME

1.1 **ELIGIBILITY:**

A candidate shall be eligible for admission in the B-Tech Programme of Civil Engineering subject to the following conditions:

The candidate has passed diploma, in relevant discipline, of minimum 3 years duration after Matriculation from Polytechnic College/Institute affiliated with State Board of Technical Education/University, or recognized by UGC/AICTE with a minimum of 50% Marks.

1.2 **GENERAL INFORMATION REGARDING LEET**

There will be two papers as per details given below:

A. **PAPER A- GENERAL**: This shall be a common paper for all streams. This shall consist of objective type questions from Physics & Mathematics taught at the 1st & 2nd semester level of B-Tech. at Islamic University Of science & Technology.

B. **PAPER B- CIVIL ENGINEERING:** This shall consist of objective type questions from the core branches of Civil Engineering.

1.3**. INSTRUCTIONS REGARDING PAPER A**:

(i) The question paper will contain multiple choice objective type questions.

(ii) Four options A, B, C and D are provided for each question. Out of the four given options, only one option is the correct answer. The candidate will be required to write his/her answer indicating one option out of the four options in the box provided for that question in the answer sheet.

(iii) There is a separate sheet for writing answers. Use only CAPTIAL letters for writing the answers in the space provided on the answer sheet.

(iv) If a candidate does not wish to attempt a specific question, the space (box) provided on the answer sheet corresponding to that question should be marked 'X'. A box left blank will be considered as wrong answer.

(v) Space for doing rough work has been provided at the end of the question paper. Use only that space for the purpose.

(vi)Question paper is to be returned at the end of the examination.

vii) There will be negative marking for wrong answers, *i.e.*, marks will be deducted for wrong answers. For each correct answer, one mark shall be awarded. For each wrong answer (or box left blank in the answer sheet), ¼ mark shall be deducted.

viii) Don't write your roll number anywhere except in the space provided.

1.4 **INSTRUCTIONS REGARDING PAPER B**:

i) The question paper shall comprise of 8 questions of subjective type & the candidate shall have to attempt 05 questions.

ii) Students should try to be brief & precise in their approach towards paper B.

1.5**. SYLLABUS**

i) **PAPER A** …. The syllabus for General paper i.e. Physics & Mathematics shall be the same as in the First year of engineering taught at the 1st & 2nd semester level of B-Tech. at Islamic University Of science & Technology.

ii) **PAPER B**…..

STRUCTURAL ENGINEERING:

Concept of engineering mechanics, scalar and vector quantities, addition and subtraction of vectors, force, System of coplanar forces, composition and resolution of force, transmissibility of forces, parallelogram law, triangle law and polygon law of forces, moments and couples, Varignon's theorem, conditions of equilibrium, Lami's theorem, Friction, laws of friction, work, power and energy, laws of conservation of energy, rectilinear and curvilinear motion, Geometrical properties of sections, Centre of Gravity and Centroid, moment of inertia, radius of gyration, parallel and perpendicular axes theorems, simple stresses and strains, Elasticity, Hook's law, stress-strain diagram, Moduli of elasticity and rigidity, stresses and strains of homogeneous materials and composite sections, Temperature stresses, Relation between elastic constants, Torsion, types of beams, types of supports and loads, concept of bending moment and shear force. Bending moment and shear force diagrams for simple cases. Deflection of beams, Moment area theorem, Bending and shear stresses in circular, rectangular, T and L sections, comparison of strength of above sections, columns and struts, Buckling of columns, Trusses. Design of singly and doubly reinforced beams, Design of columns, types of columns, short and long columns, load carrying capacity, effective length of columns, lateral and helical ties, I.S specifications for reinforcement detailing, design of slabs, types of slabs, one-way slab, two-way slab, I.S specifications for reinforcement detailing, method of design as per I.S Code ,design of foundations, isolated footing. Design of tension and compression members in structural steel, gross area, net area, tension splices, load carrying capacities, design of beams in structural steel.

TRANSPORTATION ENGINEERING: Introduction to Transportation Engineering, Importance of roads, Classification of roads, Location survey for a road project, Detailed survey for cross drainage, L-section and cross-sections, Fixing alignment of road , Factors affecting alignment of road , ,Geometric design of roads, camber, gradient, sight distance, curves-necessity, types-vertical, horizontal and transition curves, widening of roads on curves, Super-elevation, Types of road materials and tests, Design of flexible pavements, Traffic Engineering, Railway Engineering, Rails, Sleepers, ballast, points and crossing, maintenance, typical sections of tunnel, method of construction of tunnels in soft rock.

WATER RESOURCES ENGINEERING:

Properties of fluids, viscosity, Newtonian and Non-Newtonian fluids, types of fluid flow, Dimensionless numbers, Pascal's Law and its applications. Total pressure, resultant pressure and Centre of pressure on rectangular, triangular & trapezoidal surfaces. Simple differential manometers. Discharge and continuity equation, Bernoulli's theorem, statement and description, Venturimeter, orifices. Losses in pipes, flow from one reservoir to another through a long pipe of uniform cross section (simple problems). Water hammer, uniform and non-uniform flow, discharge through channels using Chezy's formula and Manning's formula. Most economical channel sections- rectangular & trapezoidal (No derivation). Measurement of discharge by notches and weirs, measurement of velocity by Pitot tube and current meter.

S**URVEYING:** Types of surveys**,** Objects of surveying, Basic principles of surveying, Linear measurements with tape, Purpose & principles of chain surveying, Obstacles in chain surveying, Compass surveying, concept of the following with simple numerical examples : Meridian, bearing, dip & declination, local attraction.

Purpose of leveling, level book & reduction of levels by: Height of collimation Method, Rise & fall Method. Contours, control interval, methods of locating contours.

Methods of Tachometry, general principles & examples of stadia tachometry. Theodolite surveying.

SOIL & CONSTRUCTION ENGINEERING:

Soil classification, index properties of soils, soil as 3-Phase system, simple numerical problems with the help of phase diagram, compaction control, density control, field density test, core cutter

method, sand replacement method, Darcy's law, coefficient of permeability, Settlement, consolidation, bearing capacity & factors affecting it, Factors contributing to shear strength of soils, Coulomb's law. Plate load test & its limitations, types & suitability of shallow foundations, pile classification, pile group. Construction details, walls, load bearing and non-load bearing walls. Brick masonry and its types, bonds in brick masonry, stone masonry, types of stone masonry, floors- types of floors, Roofs, construction procedure, Concrete and its ingredients, workability of concrete, compaction of concrete, curing of concrete, Properties of concrete. Grades of concrete.

Paper A Syllabus

Physics

Vector Analysis, Rotation of coordinate axis and transformation of vectors, Gradient of scalar field, divergence and curl of vector field in Cartesians, spherical polar and cylindrical coordinate systems, Gauss's divergence theorem, Stokes's theorem.

Collision of particles, Conservative and non-conservative forces, elastics and inelastic scattering, frames of references, laboratory and center of mass system, kinematics of elastic scattering in laboratory system, application of conservation theorem in solving collision and scattering problems.

Vibration and Acoustics, Differential equation of simple harmonic motion, energy of simple harmonic oscillator, damped harmonic motion, energy dissipation, forced oscillations, amplitude and velocity resonance, sharpness of resonance, energy consideration in forced oscillations

Electromagnetic Theory: Coulombs law and Gauss's theorem, calculation of electric field and potential, Biot -Savart's law, Ampere's theorem, divergence and curl of magnetic field, Faraday's law

Maxwell's equation, electromagnetic wave equation in free space, its solution in one dimension and discussion, energy and momentum in electromagnetic wave, Introduction to plasma: Debye shielding, plasma parameter, plasma frequency

Quantum Mechanics: De-Broglie Hypothesis, Davison Germer experiment, wave function and its properties, expectation value, quantum mechanical operator, Wave Packet, Normalisation factor, Uncertainty principle. Schrödinger Equation for free Particle, Schrödinger wave Equation; Time Dependent and Time Independent, Tunnelling effect and its example (Tunnel diode or alpha decay).

Elementary Solid State Physics: Crystal lattice, Crystal structure, Unit cells, Miller Indices, Bravais lattice, Photographic crystal X-ray diffraction techniques.

Classification of solids, formation of energy bands in metals, semiconductors and insulators, intrinsic and extrinsic semiconductors, Fermi energy.

Diffraction: Optical diffraction techniques- Fresnel and Fraunhoffer diffraction.

X-ray diffraction techniques (Single crystal and Polycrystalline materials)- Laue's method, Powder method, Oscillation and Rotation method.

Special theory of Relativity*:* Frames of reference, Michelson-Morley experiment, Basic postulates of special theory of relativity, Length contraction, time dilatation, Time-energy relation.

Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory (Qualitative only), applications of superconductors.

Lasers*:* Introduction, Principle of laser, Stimulated and spontaneous emission, Population inversion, Einstein coefficients, optical pumping, **Resonant Cavity and its modes**, He-Ne Laser, Ruby Laser, Semiconductor Lasers, Applications of Lasers.

Mathematics

Introduction to differential calculus, Leibnitz's Theorem for n^{th} derivative, Taylor's theorem, Tangent and Normal, Partial Differentiation, Euler's theorem, Double points, asymptotes, curvature and tracing of curves.

Limit, continuity and differentiability of functions of several variables, Chain rule, Jacobi theorem. Taylor's theorem of one and two variables, extrema of functions, two or more variables using method of Lagrange's multipliers.

Ordinary differential equations: Exact ordinary differential Equations and Ordinary differential equations reducible to exact differential equations. Linear differential equations and equations reducible to linear form.Linear Differential equations of second and higher order with constant and variable coefficients.

Non-linear differential equation of first order, Simultaneous differential equation, Simultaneous differential equation of the form $dx/P = dy/Q = dz/R$, Applications of ordinary differential equations,

Algebraic Equation, Elements of the theory of polynomial equations.

Fundamental theorem of Algebra, Relation between the roots and the coefficients of an equation, Solution of cubic & bi-quadratic equations

Differential Equation**:** Partial differential equations of first order, langrage linear equation Standard form, Charpit`s Method to solve non- linear partial differential equation.

Partial differential equations of second and higher, Homogeneous Partial Differential equations with constant coefficients, vibration of stretched flexible string, heat flow equation. Wave equation, solutions by the method of separation of variables. Series solutions of ordinary differential equations

Fourier Series **:**Fourier Series, Integral Calculus**:** Differential under the sign of integration. Double and triple integrals, change of variables, Beta and Gamma functions

Matrices**:** Review of algebra of matrices, partitioning of Matrices,Hermitian and skew-Hermitian Matrices. Orthogonal and unitary matrices, Triangular matrices, Rank of a matrix. Equivalent matrices, elementary transformations, Normal form

Inverse of matrix (Different Methods) and solution of simultaneous equation by elementary operation.Normal form, Eigen values, and Eigen vectors of a matrix.Caley-Hamilton theorem, Quadratic Form.

SCHEME OF EXAMINATION

Paper	**A**	**A**	**B**
SUBJECT	**PHYSICS**	**MATHEMATICS**	**CIVIL ENGINEERING**
MARKS/NATURE OF PAPER	**20 OBJECTIVE**	**20 OBJECTIVE**	**60 OBJECTIVE**