

## 2. LATERAL ENTRY ADMISSION TO THE SECOND YEAR OF UG PROGRAMME

### 2.1 ELIGIBILITY:

A candidate shall be eligible for admission in the BE/BTech programmes subject to the following conditions:

The candidate

(i) has passed

(a) diploma, in relevant discipline, of minimum 3 years duration after matriculation

OR

(b) diploma, in relevant discipline, of minimum 2 years duration after 10+2

from Polytechnic College/Institute affiliated with State Board of Technical Education/University, or recognized by UGC/AICTE with a minimum of 60% marks ( 55% for SC/ST) in aggregate or equivalent grade point.

(ii) has qualified LEET-TU with at least 20% aggregate marks (15% for SC/ST candidates).

(iii) possesses a good moral character.

(iv) is a citizen of India.

### 2.2 NUMBER OF SEATS

Lateral entry admission to the BE/BTech programme for diploma holders at the 2<sup>nd</sup> year (3<sup>rd</sup> Semester) level will be made through Lateral Entry Engineering Test to be conducted by the University (LEET-TU) for the following seats in various categories:

Category	General	SC/ST (25%)	BC (5%)	PH ( 3%)	Total
Biotechnology	3	1			4
Chemical Engineering	5	2			7
Civil Engineering	5	2	1		8
Computer Engineering	7	2	1	1	11
Electrical Engineering	6	2			8
Electronics & Communication Engineering	7	3		1	11
Electronics (Instrumentation & Control) Engineering	5	2			7
Mechanical Engineering	7	3	1		11
Industrial Engineering*(BE[IE]-MBA)	2	1			3
<b>TOTAL</b>	<b>47</b>	<b>18</b>	<b>3</b>	<b>2</b>	<b>70</b>

\*The duration of the programme for students admitted in the 2<sup>nd</sup> year of BE(Industrial Engineering) will be four years and they will be awarded two degrees(BE & MBA) at the successful completion of their four year programme.

**2.3 FEE:** The candidates admitted through LEET-TU (2010) are required to deposit the same tuition fee and other dues as applicable to the candidates admitted in BE/BTech through AIEEE-2010 in the session 2010-2011.

**2.4 CENTRES FOR EXAMINATION:** The LEET-TU will be held at TU, Patiala and Delhi only. In addition, we may have examination centres at Mumbai, Kolkata, Jammu and Chennai based on sufficient

number of options for various centres by the candidates. Highest preferred Entrance Test Centre available shall be allocated.

**The various UG programmes and their relevant diploma disciplines are given as below:**

S. No.	Name of Programme	Relevant Disciplines of Diploma
1.	(a) Chemical Engineering (b) Biotechnology	Chemical Technology/ Chemical Engineering/ Food Technology/Biotechnology
2.	Civil Engineering	Civil Engineering/ Architectural Assistantship
3.	Computer Engineering	Computer Engineering/ Computer Programming & Application/ Computer Servicing & Maintenance/Information Technology
4.	Electrical Engineering	Electrical Engg.
5.	(a) Electronics & Communication Engineering (b) Electronics ( Instrumentation & Control) Engineering	Electronics & Communication/ Electronics & TV Technology/ Electronics & Microprocessors/Electronics & Computer Engineering/Instrumentation and control Engineering/Instrumentation & Process Control Engineering.
6.	(a) Mechanical Engineering (b) Industrial Engineering*(BE[IE]-MBA)	Mechanical Engineering/Production & Industrial Engineering/ Refrigeration & Air Conditioning/ Foundry Technology / Industrial/Production Engineering / Maintenance of Plant & Machinery / Welding Technology/ Tool and Die/ Automobile.

## GENERAL INFORMATION REGARDING LEET-TU ENTRANCE TEST

**There will be two papers as per details given below:**

**Paper I            General            60 Marks            60 Minutes**  
**Paper II           Professional    90 Marks            90 Minutes**

The question paper will contain multiple choice objective type questions of one mark each.

- (i) Paper-I shall contain 60 questions in all with 15 questions in each of Physics, Chemistry, Mathematics and English. Paper-II shall contain 90 questions in the relevant engineering discipline each carrying one mark and will be answered on an answer sheet provided for this purpose.
- (ii) In each paper, 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 CAPITAL letters for writing the answers in the space provided on the answer sheet as shown in the examples given at Sr. No. ix.
- (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) **NEGATIVE MARKING** : There will be negative marking for wrong answers, *i.e.*, marks will be deducted for wrong answers. The total marks to be awarded to a candidate in this paper after imposing the penalty, if awarded will be calculated by the following formula.

For each correct answer, one mark shall be awarded. For each wrong answer (or box left blank in the answer sheet),  $\frac{1}{4}$  mark shall be deducted.

For example,

- Let R = number of correct answers  
 W = number of wrong answers  
 U = number of Unattempted questions (marked X)  
 T = total number of questions

Then the total marks obtained is  $R - \frac{1}{4}W$ . Calculated to the second place of decimal, the examiner will also check that  $T = R + W + U$

DON'T WRITE YOUR ROLL NUMBER ANYWHERE EXCEPT IN THE SPACE PROVIDED.

- (ix) Example (Showing how answers are to be filled in Answer Sheet)

- Q1 The rate of change of bending moment is equal to  
 (A) Shear force (B) Deflection  
 (C) Slope (D) Poisson's Ratio x Deflection
- Q5 For Simple Pendulum the time period of one oscillation is given by  
 (A)  $2\pi\sqrt{g/l}$  (B)  $2\pi\sqrt{2l/g}$   
 (C)  $2\pi\sqrt{l/2g}$  (D)  $2\pi\sqrt{l/g}$

**(Answer Sheet)**

1	2	3	4	5	6	7	8	9	10
A				D					

## SYLLABUS

PAPER-I GENERAL

**MATHEMATICS**

**Algebra:** Quadratic equation, equations reducible to quadratic form, relation between roots and coefficients. Arithmetic progression, Geometric progression, series of natural numbers, partial fractions, Binomial Theorem and its applications.

**Trigonometry:** Trigonometric ratios and their relations, Ratios of some standard angles, solution of trigonometric equations, sum and difference formulae, product formulas. Multiple and sub-multiple angles, solution of triangles.

**Co-ordinate Geometry:** Cartesian Co-ordinates, Equations of straight lines in various forms, Intersection of two straight lines, angles between two lines, Distance formulae, Equation of a circle in various forms, Tangent and normal to a circle.

**Differential Calculus:** Concept of a function, limit, standard limits, Continuity, Differentiation, their geometrical and physical meanings, Differentiation from first principles, Differentiation of sum, product, quotient of functions, function of a function, Differentiation of implicit functions, trigonometric functions and logarithmic differentiation.

**Integral Calculus:** Definite and Indefinite integrals, method of integration by substitution, by parts and partial fractions, Integration of rational and irrational functions.

## PHYSICS

**Heat:** Heat as a form of energy, Mechanical equivalent of heat (Joule's experiment), Specific heat of a gas, Measurement of temperature, Platinum resistance and thermoelectric thermometers, Temperature scales, kinetic interpretation of temperature. Thermal expansion. Modes of heat transfer, Searle's method and Lee's method for thermal conductivity, Black body radiations, Stefan's law. Wien's law.

**Acoustics:** Wave motion, velocity of sound, Newton's formula and Laplace's correction, Beats, Doppler effect, Intensity of sound waves, Reverberation, Acoustics of buildings, Production and detection of ultrasonic waves.

**Optics:** Refraction through a compound plate, total internal reflection, Optical fiber, image formation by spherical mirrors/lenses, Lens makers formula, Chromatic aberration and its removal, Optical instruments- simple and compound microscopes, Astronomical telescope, Magnifying power & resolving power, Huygens principle & its applications, Young's double slit experiment, Diffraction through a single slit, Polarisation of light,

**Electricity and Magnetism:** Electric field and electric potential, Electric dipole and its field, Gauss's law and applications, Energy stored in a capacitor, Dielectrics, Current Electricity, Kirchoffs laws and applications, Slide wire bridge, Potentiometer, Ammeter, Voltmeter, Thermal and chemical effects of current.

**Electromagnetism:** Magnetic effects of current, Biot-Savart law and applications, Lorentz force, Moving coil galvanometers, Laws of electromagnetic induction, Mutual and self inductance, AC generator, Alternating currents, LR, CR, LCR, circuits.

**Modern Physics:** Determination of  $e/m$  and  $e$  of electron, Bohr's model and hydrogen spectra, Spectral series, Photoelectric effect, Matter waves.

## **CHEMISTRY**

**Structure and bonding:** Fundamental particles, Heisenberg's uncertainty principle, Quantum numbers, Pauli's exclusion principle, Aufbau rule, Hund's rule, ionic and Covalent bond, orbital concept of covalency, Hybridisation (sp, sp<sup>2</sup> and sp<sup>3</sup>).

**Chemical Equilibria, Electrochemistry and Redox Chemistry:** Balancing Chemical equations, Oxidation and Reduction reactions, electronic Concept, balancing redox reactions by oxidation number method. Faraday's laws of Electrolysis and its application in Electroplating, Electrometallurgy and Electrorefining, Degree of ionisation, Equilibria in aqueous solutions, solubility product and common ion effect, Modern concepts of acid & base, their strength and ionization constant, pH value, acid base titrations, choice of indicators and Buffer solutions.

**Colloids and Water:** Particle size and colloidal state, Preparation of colloids by dispersion and condensation, Stability and properties of colloids, Tyndall effect, Brownian movement, coagulation. Hard and soft water, degree of hardness and its determination, Disadvantage of hard water in industrial use and boilers.

**Organic Chemistry:** Nomenclature of organic compounds, IUPAC system. Saturated and unsaturated Hydrocarbons, Ethane, Ethylene and Acetylene.

Substitution and addition reactions (preliminary ideas). Isomerisation (Chain position, functional, cis-trans and optical), Aldehydes and Ketones, preparation, properties and qualitative tests. Polymerisation, addition and condensation polymerisation, degree of polymerisation, Linear and cross linked polymers.

## **ENGLISH**

Idioms and phrases and their usage, Correction of sentences, sentence structure, sequence of tenses, Parts of speech, Words often confused in the form of pair of words, Common synonyms and antonyms, Active and Passive voice, Direct and indirect speech, Punctuation.

## PAPER-II PROFESSIONAL

- A. For candidates seeking admission to the discipline of MECHANICAL ENGINEERING/  
INDUSTRIAL ENGINEERING\*(BE [IE]-MBA)

**Manufacturing Process:** Dry sand and green sand casting: Casting defects: Die casting, Continuous casting and Centrifugal casting, Welding Process: Gas welding, Arc welding, Resistance welding; Thermit welding; Soldering and Brazing: Welding defects and precautions, Elements of metal cutting; Cutting tools tool geometry, Cutting fluids; Lathe and Milling operations: Grinding process, grinding wheel: Introduction to Broaching and gear generation processes; Electric discharge machinery. Water Jet machining and ultrasonic machining. Forming processes: Hot and Cold working: Rolling: Punching, blanking, shearing, spinning.

**Thermal Engineering:** Basic concept of Thermodynamics : Energy, Thermodynamics systems, types (open and closed) Heat and work, specific heat, Enthalpy, laws of thermodynamics : Zeroth, First and Second laws Reversible and irreversible process, Entropy.

Description of various types of Boilers, boiler mountings and accessories. Basic concepts of thermal conduction, convection and radiation. Basic equations of different cases of Conduction. Convection (natural and forced) and radiation. Concept of Black, white and opaque bodies, Stefan Boltzmans laws.

**Mechanics of Solids:** Concepts of bending moment and shear force. Bending moment and shear force diagrams for cantilevers, simply supported beams, overhanging beams subjected to concentrated and U.D. Ls. Concepts of torsion. Derivation of torsion equation for circular shafts. Close coiled helical spring subjected to axial load and twisting moment, stiffness of a spring. Its angle of twist, strain energy and proof resilience.

**Metrology:** Necessity and importance of Metrology in Engineering field, standards of measurements, line and wave length : Limits, fits and tolerances. Concept of interchangeability. Angle and Taper Measurements : Slip gages and dial indicator in taper measurement. Screw Thread Measurements : Measurements of Major diameter, Minor diameter, effective diameter, pitch. Angle and Form of threads for external and internal threads. Comparator : Types of Comparators (Mechanical, optical, electrical, electronic and pneumatic). Limit gauges : Go and No-go gauges. Alignment tests on lathe. drilling machine. Milling machine and grinding machine.

**Materials and Metallurgy:** Introduction to Engineering materials, ferrous and non-ferrous materials : Pig iron grey and white cast iron, alloying elements in steel and their effect. High speed steel, heat resistant steel and spring steel. Aluminium and its alloys. Bearing metals. Plastic materials, refractory materials, tempering, hardening and surface hardening processes, selection of materials for different components.

**Industrial Engineering and Management:** Work study, uses of work study : Objectives and basic procedure of Method study and work measurements. Types of inspection, inspection at various stages. Quality control : its advantages : Statistical quality control. Control charts and sampling plans. Types of production : Materials requirements planning, Plant location and layout, types of layouts and their comparison. Importance and advantages of standardization. Cost reduction through standardization. Management of men, materials and machines. Types of industrial organisations : Wages and incentives, trade unions : Role of technician in industry.

**Refrigeration and Air Conditioning:** Basic concepts and principles of refrigeration : Refrigeration methods. Air refrigeration cycle, vapour compression cycle, simple vapour absorption cycle, their applications and limitations. Refrigerants : Important properties of refrigerants, properties and applications of commonly used refrigerants such as R11, R12, R22, NH<sub>3</sub> etc. Air conditioning, its concepts. Human comfort, application of air conditioning, Description of room air conditioning, packages air conditioner, central air conditioning system.

**Theory of Machines:** Simple mechanisms : Flywheels, Co-efficient of friction, Motion of a body along horizontal and inclined planes. Friction in screw jack, friction between nut and screw square and V-threads. Concept of power transmission, various power transmission systems with their merits and demerits. Flat and V-belts drives, ratio of tensions. Horse power transmitted, centrifugal tension, condition for maximum power transmission, function of governors. Definitions of sensitivity, stability, synchornism and hunting of governors, description and simple problems on watt, porter and Hartnell governor.

**(B) For candidates seeking admission to the discipline of ELECTRONICS & COMMUNICATION ENGINEERING, ELECTRONICS (INSTRUMENTATION & CONTROL) ENGINEERING**

**Basic Circuit Elements:** Circuit laws and their applications in solving problems. Characteristics and applications of different types of diodes, Concepts of bipolar transistors and common base common emitter, common collector configuration and parameters.

**Amplifiers:** Different types of amplifiers, working principles and experssion of voltage gain, current gain, input impedance, output impedance, etc.

**Network Analysis:** Working principles of Multivibrators, time base, operational amplifier, timer and regulated power supply. Network theorems, all types of network, one port, two port, symmetrical, unsymmetrical balanced, T. Ladder, lattice, bridge, their characteristic impedance. Attenuators, filters. concept of different types of filters, Impedance matching of filters. Transmission lines, concept and applications, characteristics impedance, different methods of loading, concepts of reflection and standing waves. Automatic Telephony.

**Communication Theory and Systems:** Communication systems types, types of modulation, amplitude modulation, frequency modulation, AM modulators. Demodulation of AM waves, FM waves, transmitters and radio receivers. Antenna and wave propagation. Types and areas of applications. Conducting materials, low and high resistivity materials, super conductivity. Development of modern insulating materials. Magnetic materials, permeability, Hysteresis loop, soft and hard magnetic materials. Components, Capacitor, polyster, Metallised, polyster gap ceramic, paper and electrolytic types. Resistors of different types. Transformers, Inductors and RF Coils, Printed circuit boards.

**Measuring Instruments:** Multimeters, types, application, different types of mV meters and mA meters-extension of range. CRO, operation, working applications, Audio power meter, impedance bridges. Q.meter, Regulated power supply, block diagram, significance, Digital instruments, block diagram, comparison with analog instruments.

**Microprocessors and its applications:** Microprocessor, structure of 8085. Instruction set and addressing mode. Simple programming in assembly language. Input/output operations, concept of interrupts structure and programming of 8155/8156. Microprocessor applications.

**Transducers:** Electro-acoustic transducer, microphones, loudspeakers, sound recording in different types, hi-fi and PA system. VCR and Video recording. T.V. equipment and Video display unit.

**Power Electronics:** Thyristor, principle, characteristics and applications in industry.

**TV Engineering:** Introduction to Monochrome TV receiver circuits and basics of colour TV systems.

**(C) For candidates seeking admission to the discipline of COMPUTER ENGINEERING**

**Analog & Digital Electronics**

PN junction diode, V-I characteristics, Diode as half wave, full wave and bridge rectifier, Zener diodes, CB, CE, CC configuration of the transistor, Binary and hexadecimal number system, Binary addition, subtraction, multiplication and division, Logic Gates, DE Morgan's Theorems, K-Map, TTL and MOS families, BCD, excess-3 and Gray code, Arithmetic circuits, Decoders, Multiplexers and De-Multiplexers, flip flops, Counters, Types of RAM/ROM, A/D and D/A conversion.

**Programming Language C**

Constants, variables and data types, Operators and Expressions, Control Structures, Functions, Arrays, Pointers, Strings, Structure and Unions, File Handling.

**System Analysis and Design**

Systems Development Life Cycle, Feasibility Study, cost and benefit analysis, Requirement Specifications and Analysis.

**Introduction to Databases**

Architecture and structure of Database Management System, data independence, ER Diagrams, Introduction to network, hierarchical and relational model, Domain, Attributes, Tuples and Relations, Entity and referential integrity, keys, Normalization, First, Second and Third normal forms, Boyce/Codd normal form, Structured Query Language: DDL and DML statements.

**Data Structure**

Basics, Arrays, Operations on arrays with Algorithms (searching, traversing, inserting, deleting), Traversing a linked list, Searching linked list, Insertion and deletion into linked list, Application of linked lists, Doubly linked lists, Stacks, Queues, Binary Trees, Search algorithm (Linear and Binary), Sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Selection Sort, Merge Sort, Heap Sort) and their comparisons.

**Computer Architecture**

Instruction Code, Instruction Cycle, Instruction types, Design of basic computer, Register Organization, Addressing modes, Introduction to RISC, CISC architecture, Control Unit - Hard wired and Micro programmed, Pipeline processing, Memory Hierarchy, associative memory, cache memory, virtual memory, I/O organization.

**Data Communication and Computer Networks**

LAN, MAN and WAN, OSI Model, Topologies, Basic access protocols: CSMA/CD, Token Passing, Ethernet, Error Detection, Network connectivity Devices, NICs, Hubs, Repeaters, Multiplexers, Modems, Routers and Protocols, Firewall, ATM, Different classes of IP addressing, Protocol Suites.

**Object Oriented Programming Using C++**

Procedure oriented programming Vs. Object oriented programming (OOP), Classes, Objects, reusability, encapsulation, dynamic binding, message passing, Constructor and Destructor, Member Functions, Overloading Member Functions, Inheritance, Protected, private and public data, types of inheritance, single inheritance, hierarchical inheritance, multiple inheritance, Polymorphism and Virtual Functions.

### **Operating System(OS)**

System Software: Compiler, Assembler, Loader, Definition, types and importance of Operating Systems, Memory organization, Process Management Functions, Job Scheduler, Process Scheduler, Process synchronization, Memory Management Function, Segmentation, Swapping, Simple Paging System, Virtual Memory, I/O Management Functions, Dedicated Devices.

## ***(D) For candidates seeking admission to the discipline of ELECTRICAL ENGINEERING***

**Introduction:** Comparison of copper and aluminum as electrical conducting material. Development of modern insulating materials. Development of dynamo grade and transformer grade silicon sheet steel materials. Circuit laws and their applications in solving problems. Concept of permeability, reluctance, mmf, coreless. concept of phase difference, phase representation of alternating quantities.

**Poly Phase System:** Production of rotating magnetic field in electrical machines. Characteristics of D.C. machines. Shunt series and compound types, speed control of D.C. motors. Transformer-single phase, three phase, phasor diagrams, equivalent circuits, testing, regulation, losses, efficiency, parallel operation, maintenance.

**Three Phase Induction Motor:** Slip, torque & their various relations. Torque-slip characteristics, equivalent circuit, starting, testing, speed control, maintenance.

**Single Phase Induction Motor:** Torque/Speed characteristics, methods of producing starting torque, capacitor, shaded pole and reluctance motors.

**AC Series Motor, Universal Motor:** Synchronous machines : Speed/frequency relation, EMF equation, winding coefficients, synchronous impedance concept, phasor diagram, Regulation. Parallel operation, V curves, starting.

**Measuring Instruments:** Indicating, integrating and recording instruments : deflecting, controlling and damping torques ; moving coil and moving iron instruments, sources of errors extension range Wattmeters, Dynamometer type, maximum demand indicators, Energymeters-single phase and three phase, Megger, Earth tester, Multimeter, power factor meter.

**Electronic Instruments:** VTVM, CRO, Electronic multimeter, Analog multimeter, digital meters. Measurement of inductance and capacitance and capacitance, power measurements in 3 ph. Circuits.

**Transmission System:** Selection of voltage, comparison of A.C. and D.C. systems, comparison of 3 ph. & 1ph. Systems. Electrical features of transmission line : Calculation of resistance, inductance and capacitance in a.c. transmission lines. Problems on efficiency and regulation, corona. Distribution system : Layout of H.T. and L.T. distribution system. Comparison of overhead and underground distribution system. Estimation, Generation.

Conventional and Non-conventional sources of energy. Different types of power stations. Comparison, Load estimation – concept, types of power stations, comparison, Load estimation, concept of regional and national grid. Switch gear system :- Circuit breakers, Types, ratings, Comparison, Protection :- Fuses, relays, types & characteristics, comparison. Protection schemes of generators, transformers, bus bars, feeders.

**(E) For candidates seeking admission to the discipline of CIVIL ENGINEERING**

**Structural Engineering:** Simple stresses and strains, Elasticity, Hooke's Law, Moduli of Elasticity and Rigidity. Stresses and strains of homogeneous materials and composite sections. Types of beams and supports and loads, concept of bending moment and shear force. Bending moment and shear force diagrams for simple cases. Deflection in beams. Moment area theorem, Bending and shear stresses in circular, rectangular, T and L sections, Comparison of strength of the above sections, Design of singly and doubly Reinforced beams, Design of columns-Types of Columns. Short and long column, load carrying capacity, effective length of column, 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 rectangular footing, square footings, circular footings. Design of tension members in structural steel, gross area, net area, tension splice, design of tension member . Design of compression members, column splice, load carrying capacities. Design of beams in structural steel.

**Surveying:** Linear measurements with tape, corrections, chain surveying, offsets, perpendicular offset, oblique offset, measurement of offsets, limiting length of offset, Field book, Instructions for booking field notes, Instruments for setting out right angles, Compass surveying , Prismatic compass. Surveyor's compass, comparison between prismatic and surveyor's compass, meridians & bearings, calculation of included angles from bearings, calculation of bearing from including angles, local attraction, magnetic declination levelling, types of levels. Principles of levelling, Classification of levelling. Rise & Fall method, Height of Instrument method, various corrections in levelling . Theodolite surveying, measurement of angle by theodolite.

**Transportation Engineering:** Introduction of Transportation Engineering, Traffic Engineering, Road materials, Geomatic design, Design of flexible and rigid pavements, Road maintenance, Railway Engg. Rails, Sleepers, ballast, points and crossing, Track laying and track maintenance, typical sections of tunnel, method of construction of tunnels in soft rock.

**Soil and Construction Engineering:** Foundations-types, construction details, walls, load bearing and non-load bearing walls, brick masonry, bonds in masonry, stone masonry, type of a stone masonry, partition walls, doors. Floors-types of floors, construction procedure, maintenance of buildings, properties of bricks and stones, cement, aggregates, workability of concrete, Batching, mixing, compaction, placing, curing of concrete. Properties of hardened concrete. Introduction to soil mechanics, Soil classification. Index properties of soil, Shear strength concept.

**Fluid Mechanics, Irrigation and Water Supply Engineering:** Specific weight, density, specific gravity, viscosity, vapour pressure, cohesion, adhesion, surface tension, capillarity and compressibility. Pressure, intensity of pressure, pressure head, pascal's Law and its applications. Total pressure, resultant pressure and centre of pressure on rectangular, triangular, trapezoidal, circular and curved surfaces. Atmospheric, gauge and absolute pressure, simple differential manometers. Steady and unsteady flow, laminar and turbulent flow,

uniform and nonuniform flow. Discharge and continuity equation, Bernoulli's theorem, statement and description, venturimeter, orifices, time of emptying tanks of uniform cross section by a single orifice. Laminar and turbulent flow explained through Reynolds experiments, Reynolds number and critical velocity and velocity distribution, losses in pipes, hydraulic gradient line, total energy line flow from one reservoir to another through a long pipe of uniform and composite section. Water hammer, uniform and non-uniform flow, discharge through channels using Chezy's formula and Manning's formula. Most economical sections, rectangular, trapezoidal and circular. Measurement of discharge by notches and weirs, measurement of velocity by pitot tube and current meter. Introduction to irrigation Engg. Flow irrigation, head works and river training works, water logging, water supply, sources of water, Water treatment. Types of pipes, laying of pipes. Quality of sewage, laying of sewers, Building drainage and rural sanitation.

**(F) For candidates seeking admission to the discipline of CHEMICAL ENGINEERING and BIOTECHNOLOGY**

**Basic Chemical Engineering:** Units & conversions, Dimensional analysis, Gas Law, Material Balance consisting key components, simultaneous Equation By pass and recycle. Energy Balance. The first law type of heat effects, heat capacities, thermochemistry.

**Fluid Flow and Mechanical Operation:** Flow of incompressible Fluids, Laminar and Turbulent Flow in Pipes, Frictional Losses in pipes.

**Flow Measurement:** Pitot tube orifice meter, venturimeter, Rotameter, Weir & Notches, (their construction and derivation with formula ).

**Transportation of Fluids:** Classification of Pumps, construction and operation of reciprocating, rotary, centrifugal and gear Pumps. Different type of valves, fans, blowers and compressors, Description of various size reduction equipments and law's for power requirement. Separations, Screening, filtration thickeners, classifiers, Centrifuges and cyclone separator.

**Heat Transfer & Mass Transfer**

**Heat Transfer:** Conduction, Fourier's law, Heat Flow through composite walls, Cylinders and spheres, insulations.

**Convection:** Natural & Forced convection, LMTD, Significance of Reynold number, Prandit's number and Grashof Number.

**Radiation:** Kirchoff's Law, Emissive power, wein's displacement law, stefan Boltzman law, Emissivity, Absorptivity, Black Body and Green Body radiations. Boiling, Condensation and evaporation, Heat Exchanger: Double Pipe Shell & Tube.

**Mass Transfer:** Principles and Description of various unit operations involving mass transfer such as Distillation, Absorption, Extraction, crystallization & Drying.

**Unit Processes & Process Technology :** Principles of some unit Processes such as Nitration. Sulphonation, Halozenation, Oxidation, Reduction, and Products based on them. Basic Processes for the manufacture of products such as sugar, Fertilizer. Dyestuffs and paints.

**Process Instrumentation & Control:** Principle and Application of following Instruments device. Pressure and Vacuum Gauge, Thermometer and Pyrometer, Liquid Level meter : Visual indicators, Float actuated level meter.

**Analysers:** PH meter, oxygen analyzer colorimetric analyzers, Infra red & near Infix analyzer.

**Transmission:** Pneumatic and Inductance transmission. Concept and advantage of automatic Process Control.

**Controllers:** Pneumatic, Electronics, hydraulic, FD, TI, ID Controllers.

**Engineering Material:** Types of Different materials, such as metals, alloys and polymer their structure. Composition and application of these materials for various situations in Chemical Industry.

## PAPER – 1(GENERAL)

### PHYSICS

1. The earth receives solar radiation, from which one can find the temperature of the surface of the sun. The approximate temperature of sun's surface is  
(A) 600 K    (B) 900 K    (C) 60,000 K    (D) 6,000 K
2. The characteristics of a fuse wire should be  
(A) low resistivity and high melting point.  
(B) high resistivity and high melting point.  
(C) high resistivity and low melting point.  
(D) low resistivity and low melting point.

### CHEMISTRY

1. When HCl gas is passed through a saturated brine solution, NaCl is precipitated because  
(A) NaCl is not soluble in acidic solution.  
(B) Solubility product of NaCl decreases in presence of  $H^+$  ion.  
(C) Saturated solution cannot hold any more solute, hence NaCl precipitates.  
(D) In presence of  $Cl^-$  ion, ionic concentration exceeds solubility product of NaCl, therefore NaCl separates out.
2. When 13.5 gm of Al is deposited on passing current through molten Alumina, the number of faradays of electricity consumed would be  
(A) 0.5    (B) 1.0    (C) 1.5    (D) 2.0

### MATHEMATICS

1. If the quadratic equation  $(a^2+b^2)x^2+2b(a+c)x+(b^2+c^2)=0$  has equal roots, then
  - (A) a, b and c are in A.P.
  - (B) a, b and c are in G.P.
  - (C) a, c and b are in A.P.
  - (D) a, c and b are in G.P.
2. If the angles of a triangle ABC are in the ratio 1:2:3, then a:b:c is
  - (A)  $1 : \sqrt{3} : 2$
  - (B)  $1 : \sqrt{2} : \sqrt{3}$
  - (C)  $1 : 2 : 5$
  - (D)  $1 : 2\sqrt{2} : 3$

## **ENGLISH**

1. Choose the appropriate antonym for the following : "Fundamental"
  - (A) superfluous
  - (B) superficial
  - (C) profound
  - (D) particular
2. Choose the most appropriate ACTIVE form for the PASSIVE sentence given

below :

PASSIVE : "They are likely to be punished"

ACTIVE :

- (A) It is likely that they will be punished.
- (B) It is likely for someone to punish them.
- (C) It is likely that someone will punish them.
- (D) Someone is likely to punish them.

## **PAPER – II(PROFESSIONAL)**

### **COMPUTER ENGINEERING**

1. The structure of the Colpitts oscillator is related to the
  - (A) Hartley oscillator
  - (B) Wein Bridge oscillator
  - (C) Phase shift oscillator
  - (D) Square wave oscillator
2. Microprogramming refers to
  - (A) Developing software for a small computer, like a palmtop.
  - (B) Programming in any situations where the memory available is very low
  - (C) Control programs for controlling gates within a CPU.
  - (D) Writing programs in assembly language.

## **CIVIL ENGINEERING**

1. A combined footing is generally used when
  - (A) Number of columns is more than two and they are spaced far apart.
  - (B) Number of columns is two and they are spaced far close to each other.
  - (C) Number of columns is two and they are spaced far apart.
  - (D) There is only one column.
2. In slow sand filters, the rate of filtration of water is in the range of
  - (A) 175-250 lits/sqm/hr
  - (B) 500-1000 lits/sqm/hr
  - (C) 1000-5000 lits/sqm/kr
  - (D) 6000-10,000 lits/sqm/hr

## MECHANICAL ENGINEERING/ INDUSTRIAL ENGINEERING\*(BE[IE]-MBA)

1. When fluid flows in a pipe, the Nusselt number can be calculated from the relation  
(A)  $V.D.\rho/\mu$  (B)  $\mu.C_p/K$  (C)  $h.D/K$  (D)  $K.D/C_p$
2. Angle of torsion refers to the  
(A) Maximum angle by which the shaft bends during power transmission.  
(B) Angle through which one end of a shaft will twist relative to the other end.  
(C) Angular velocity of the shaft in radians.  
(D) Angular moment at the cross section.

## CHEMICAL ENGINEERING

1. Stainless steel 316 contains  
(A) 18% chromium and 11% nickel  
(B) 16% chromium and 13% nickel  
(C) 11% chromium and 18% nickel  
(D) No chromium and 8% nickel.
2. The viscosity of a liquid  
(A) Is directly proportional to temperature.  
(B) Is inversely proportional to temperature.  
(C) Is directly proportional to the square root of temperature  
(D) Is inversely proportional to the square root of temperature.

## ELECTRONICS & COMMUNICATION ENGINEERING/ ELECTRONICS(INSTRUMENTATION & CONTROL) ENGINEERING

1. A direct coupled amplifier has a gain of 1000 and 3 dB frequency of 1000 KHz. What is its unity gain frequency?  
(A) 100 KHz (B) 1000 KHz (C)  $10^8$  Hz (D) 10 KHz

## ELECTRICAL ENGINEERING

1. For parallel operation of two alternators, which of the following factor(s) should be identical for both ?  
(A) Voltage only (B) Frequency  
(C) Phase sequence (D) All of the above.
2. Mark the correct answer below as the load on an induction motor is increased upto full load :

	PF	Slip	Efficiency
(A)	increases	increases	increases
(B)	decreases	increases	increases
(C)	decreases	decreases	decreases
(D)	increases	decreases	decreases