Aptitude Test-2010
Syllabii
For Ph.D/M.Sc.(Engg)
Programmes
VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

SCHEME OF APTITUDE TEST-2009

For Ph.D/M.Sc.(Engg)

For Faculty of Engineering & General Science

Common to:

Part I: Mathematics Section
Questions carrying one mark - 30 questions
(Objective/multiple choice, covering full syllabus)

Part II: Discipline Oriented Section
Questions carrying one marks - 50 questions
(Objective/multiple choice, preferably involving numericals covering full syllabus)

Part III : Aptitude section
Reading Comprehension data Sufficiency & Data Interpretation, Logical Reasoning computer awareness - 20 questions

TOTAL 100 marks
VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

Topics of Syllabus for the Qualifying Exam for the Ph.D. Programme
Syllabus for the Technical Aptitude Test-2009
For Faculty of Engineering & General Science

Part I: Mathematics Section

Questions carrying one mark - 30 questions
(Objective/multiple choice, covering full syllabus)

Common to:
Civil Engineering Science / Mechanical Engineering Science / Electrical Engineering Science / Computer Sciences / Textile / Silk Engineering / Chemical Engineering / Polymer Science / Bio-Tech / Architecture / Physics / Chemistry / Mathematics & M.Sc (Engg)

SYLLABUS IN MATHEMATICS

1. Matrices: Definition, Rank of matrix, Systems of m linear equations with n unknown, Eigen value and eigen vectors of a square matrix.

2. Calculus
   a) Differential Calculus: Limits and Continuity, Differentiation and its applications, Partial Derivatives (Basic)
   b) Integral Calculus: Reduction formulae, Definite Integrals, Properties and Multiple Integrals,

3. Vector Algebra; Complex numbers: Definitions, Vector products, Properties; Amplitude & Modules of a complex number, De Moivere’s theorem and examples.

4. Applied Mathematics - Laplace Transforms (Elementary transformation), Fourier series, (Basics definition and examples.) , half range Fourier series and harmonic analysis.


6. Statistics and Probability
   Measures of central tendency and dispersion curve fitting by least square methods. Correlation and regression. analysis
   Probability: Axioms, conditional probability, probability distribution-Binomial poisson and normal distribution

TEXT BOOKS:
2. Elementary Engineering Mathematics- Dr. B.S. Grewal
3. Advanced Engineering Mathematics –Erwin Kreyszig
4. Introduction to Numerical Analysis –S.S. Sastry

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

Topics of Syllabus for the Qualifying Exam for the Ph.D. Programme
Syllabus for the Technical Aptitude Test-2009

For Faculty of Engineering & General Science

Part III: Aptitude section
Questions carrying one mark - 20 questions
(Objective/multiple choice, covering full syllabus)

Common to:

Syllabus in Aptitude section

Reading Comprehension data Sufficiency & Data Interpretation, Logical Reasoning & Computer awareness
VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
Topics of Syllabus for the Qualifying Exam for the Ph.D. Programme
Syllabus for the Technical Aptitude Test-2009

Part II: **Discipline Oriented Section** - 50 questions
Questions carrying one marks
(Objective/multiple choice, preferably involving numericals covering full syllabus)

**CIVIL ENGINEERING SCIENCE**

**Structural Analysis**
- Structural Systems
- Methods of Joints and Sections and Truss Analysis
- Strain Energy
- Arches and Cables

**Fluid Mechanics**
- Open Channel Flow
- Water Hammer
- Dimensional Analysis
- Impact of Jets on Vanes
- Turbines
- Centrifugal Pumps

**Concrete Technology**
- Fresh Concrete and Hardened Concrete
- Mix Design
- Special Concretes
- Non-destructive Testing of Concrete

**Design of Concrete Structures**
- Principles of Limit State Design
- Serviceability Limits
- Effective Lengths
- Design Loads
- Anchorage of Bars
- Lateral Stability of Beams

**Geotech**
- Index Properties of Soil
- Classification of Soils
- Soil Structures
- Compaction of Soil
- Consolidation of Soils
- Shear Strength of Soil

**Transportation**
- Highway Planning and Alignment
- Design Principles
- Pavement Materials and Construction
- Wind Analysis and Site Selection for Airports

**Irrigation Engineering**
- Water Requirements of Crops
- Canals, Diversion Works,
- Gravity and Earthen Dams

**Steel Structures**
- Steel Structural Fasteners
- Tension – Compression – Flexure Members
- Connections

**Theory of Elasticity**
- Plane Stresses and Plane Strain
- Principal Stresses and Principal Strains
- Strain Displacement Relationship
- Equilibrium and Boundary Condition
- Generalised Hook’s Law

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM  
Topics of Syllabus for the Qualifying Exam for the Ph.D. Programme  
Syllabus for the Technical Aptitude Test-2009  

Part II: **Discipline Oriented Section**  
- 50 questions  
Questions carrying one marks  
(Objective/multiple choice, preferably involving numericals covering full syllabus)  

**Mechanical Engg. Science**  
*(IP/IEM/Auto/ME/ & Other Allied branches)*  

I. Prime movers (I. C. Engine)  
Classification of I. C Engines - 2 Stroke & 4 Stroke Petrol & Diesel Engines.  
Concept of Mechanical efficiency BHP & IHP Laws of I\(^{st}\) & II\(^{nd}\) Thermodynamics,  
zeroth Law, applications.  

II. Refrigeration & Air-conditioning – properties – COP unit of Refrigeration,  
Refrigeration effect, Tonne Refrigeration.  

III. Manufacturing Process part of a lathe, operation in a lathe, Types of Drilling  
Machine, operation a Drilling machine.  
Types of milling machines, operation on milling machines  
Grinding machines, bonding materials, grinding terminology. Type of grinding machine,  
Soldering,  
brazing & welding classification & types. Lubrication & bearing types.  

IV  Power transmission & mechtronics  
Belt drives, gear drives,  
Introduction to mechanics- open loop & closed loop control System  
Advantages & Disadvantages.  

V  Heat treatment of Metals-Anreding, Normalizing harding, tempering,  
carburizing, cyaniding, Nitriding  
and flame hardening, Iron, Carbon equilibrium diagram.  
Composite Materials – Types of martain materials, FRP & MMC advantages & applications.  

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**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM**

**Topics of Syllabus for the Qualifying Exam for the Ph.D. Programme**

**Syllabus for the Technical Aptitude Test-2009**

**Part II: Discipline Oriented Section**

Questions carrying one mark
(Objective/multiple choice, preferably involving numericals covering full syllabus)

**Electrical Sciences**
*(ECE/EEE/IT/TC/BM/ML and other allied branches)*

1. Fundamentals & AC Circuits Network Theorems.
2. Electrical Machines AC & DC, Transformers
3. Diode Circuits – Amplifiers, op – Amp Applications.
5. Sequential logic circuits – Flip flops & counters, shift Registers
7. Thyrestors – Choppers & Inverters.
9. Microprocessors – Architecture, operation, programming and interfacing
10. Transducers.

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### VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

**Topics of Syllabus for the Qualifying Exam for the Ph.D. Programme**

**Syllabus for the Technical Aptitude Test-2009**

**Part II: Discipline Oriented Section**

- 50 questions

Questions carrying one marks

(Objective/multiple choice, preferably involving numericals covering full syllabus)

<table>
<thead>
<tr>
<th>Computer Sciences (CSE/ISE/MCA)</th>
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<tbody>
<tr>
<td>1. Discrete Mathematical Structures (Set Memory Fundamentals of Logic, Relations functions)</td>
</tr>
<tr>
<td>2. Computer Organization (as per CSE46 Syllabus)</td>
</tr>
<tr>
<td>3. Data Structures using C (Stack, recursion, Queues and lists, Trees, sorting, searching)</td>
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<tr>
<td>4. Operating systems (as per CS 52 Syllabus)</td>
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<td>5. OOP with C++ (as per CSE 36 Syllabus)</td>
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<tr>
<td>6. DBMS (as per CS53 Syllabus)</td>
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<tr>
<td>7. Analysis &amp; Design of Algorithms (as per CSE 43 Syllabus)</td>
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<tr>
<td>8. object oriented Analysis &amp; design (as per CS 72 Syllabus)</td>
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</tbody>
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Part II: **Discipline Oriented Section** - 50 questions

Questions carrying one mark

(Objective/multiple choice, preferably involving numericals covering full syllabus)

**Textile / Silk Technology**


Introduction to regenerated fibers, chemistry and physics of viscose rayon production. Production of modified viscose rayon, brief out line on production of acetate & cupramonium rayon. Manufacture of Tencel, ‘Modal’ and ‘lyocell’ fibre.

Modern developments in blowroom machineries, evaluation of blowroom performance, calculation regarding blowroom line.

Need of blending, Process modification required in blowroom for processing various blends like Polyester/cotton, Polyester/viscose, silk and its blends. Types of blending operation and blending procedure.
Various quality control studies in blowroom like alp rejection percentage, cleaning efficiency within and between lap variations.

**Carding:**
Objects of carding, detailed study of working of revolving flat card, card clothing, autolevellers, setting of different parts and effect of changing the setting on sliver quality, methods of grinding, stripping calculation of production, draft etc. in carding.
Developments in modern carding such as developments in preceding zone, speeds, efficiency etc.
Developments in post carding zone.
Modern cards, their applications – tandem card, various quality control studies in carding.

**Winding:**

**Warping:**

**Sizing:**

Head stock – dry splitting comb, drag roll. After waxing, cut mark motion, beam pressing, PIV and friction clutch.
Controls in sow box – stretch and its control, moisture measurement and temperature control.
Recent trends in sizing Viz. Foam sizing solvent sizing. Hot melt sizing, high pressure squeezing,
Sizing defects and remedies.
Post sizing operations – Drawing – in, leasing, knotting, automatic drawing in machine.

Chemicals and auxiliaries used for textile wet processing and their functions. Introduction to
shearing and cropping. Objects of shearing and cropping.

Objects of singeing, methods of singeing by various singeing machines, precautions to be taken
during singeing, latest developments in singeing.

Objects of desizing, methods of desizing, continuous desizing, desizing of cotton and other blend.
latest developments in desizing.

Objects of scouring, mechanism of scouring, methods of scouring, scouring of natural cellulose
fabrics, degumming of silk, scouring of wool and jute, scouring of synthetic, modifications required
to scour knitted fabrics, latest developments in scouring.

Objects of Bleaching, mechanism of bleaching, methods of bleaching, bleaching of cellulose fibres,
fibres, bleaching of natural protein fibres, bleaching of common manufactured fibres, bleaching of
common whitening, optical whitening process for common fibres. Chemistry of optical whitening
agents.

Objects of mercerization, history and developments of mercerization, physical and chemical
changes in cotton due to mercerization, various factors affecting mercerization, methods of
mercerization – yarns and fabrics, machines used for mercerization, slack mercerization, Hot
mercerization, Faults in mercerization and their remedies, Test methods for mercerized materials.
Latest developments in mercerization.

Characterization of solid state structure of textile fibres using X-rays IRS, NMR, UVS, SEM, TEM &
DGC. Various Two phase models for studying two phase and one phase physical structure fibres.
Description of physical structure of cotton, wool, silk, PET, Nylon and acrylic fibres.

**Moisture relations**: Concept of moisture equilibrium, moisture hysterisis, moisture regain, heat
of absorption, swelling of textile fibres. Effect of moisture on various property of fibres.
Mechanical properties: Stress and strain behaviour, factors affecting tensile behaviour, structure and tensile property correlation, Elastic recovery and weaklink effect. Stress relaxation, creep, factor affecting stress relaxation, dynamic mechanical properties and their application. Flexural and tensional properties, Frictional properties, Amontons laws of friction, deviation of these laws in fibre friction, Bowden and Tabors theory of friction. Optical properties, measurement of birefringence, luster. Importance of optical properties. Electrical properties: Electrical resistance, static electricity, dielectric properties. Measurement of these properties. Thermal properties: Thermal conductivity, specific heat, thermal conductivity and thermal expansion.


Texturising:

Drawing:

Combing:
Objects of combing, Hook theory. Preparatory process for combing sliver lap, ribbon lap, and uni lap machines. Types of comber. Sequence of operations in rectilinear comber, straightening of hooks, parameters influencing the combing operations. Influence of feed stock on combing,

**Speed Frame:**
Objects of speed frames, operating sequence, operating regions of speedframe, drafting arrangements and systems. Spindle and flyer – design of spindle and flyer. Winding of bobbin – mechanism, package built bobbin drive, cone drive, lifter motion and builder motion, bobbin leading and flyer leading mechanism, chase length, differential gearing mechanism. Study of features of various modern speedframes. Quality control studies in speedframe, calculations pertaining to speedframe.

**Shedding :**
Different types of shed. Positive and negative tappet shedding. Heald reversing mechanism. Staggering of healds, tappet shedding and their characteristics. Different types of tappets. Merits and demerits of tappet shedding, timing, setting, early and late shedding. Study of different types of reed, reed count, healds, heald count

**Picking :**
Methods of picking, essentials of goods picking, defects in negative picking. Timing setting of picking mechanism. Different types of under picking mechanisms. Early and late picking. Shuttle checking devices, box settings, pickers, picking band, stick, check strap buffer, swell etc., Shuttle trap, weak and harsh pick.

**Beat-Up :**
Theory of Beat up. Design features and working of beat up mechanism, eccentricity of sley. Factors affecting the sley eccentricity.

**Secondary Motions :**
Take up motion, - 7 wheel take up. Timing and settings, continuous take up motion. Let-off motions - positive and negative types.

**Auxiliary Motions :**

Speed and production calculation of plain looms.

**Box Motions:** 4x4 box motion, circular box motion.
**Automatic Looms:**
Cop changing, shuttle changing looms, feelers, types of feelers, shuttle eye cutters, temple eye cutters and their settings -
Chemicals and auxillaries used for textile dyeing and their functions. Chemical constitution of dyes. Effect of fibre structure on dyeing behaviour.
Properties, Selection and application of various dyes like direct dyes, basic dyes, acid dyes, sulphur dyes, Azoic dyes, Vat dyes, Sol-vat dyes, Mordant dyes, Reactive dyes, Disperse dyes, Modified basic dyes on important natural and manufactured fibres. Various after treatments given to dyed goods.
Introduction to natural dyes and their methods of application
Preparatory process for garment dyeing, speciality chemicals and dyes used for garment dyeing.
Different types of dyeing practices for various types of garments, precautions to be taken for effective dyeing of garments. Quality control in garment dyeing.
Working principles of dyeing machinery for yarns, fabrics and garments. Latest developments in dyeing machinery
Brief study on eco-friendly dyeing processes.
Dyeing of blends and knitted fabrics
Introduction to colour measurement and computer colour matching.

**Ring Frame:**

**Doubling Frame:**
Objects of doubling process. Construction and working of a doubler. Dry doubling and wet doubling. Different methods of threading the yarn through delivery rollers. Properties of various doubled, cabled, voile, poplin, crepes, chiffon yarn etc. Sewing thread production & properties.
Fancy yarns and fancy doublers - methods of threading for some fancy yarns. Preparation of standard yarn packages. Hosiery yarn and its manufacture, properties and end uses.

**Open End Spinning:**


**Dobby Looms:**

Mechanical design and working principles of different types of dobbies such as negative, positive, cam, paper, rotary, cross border dobbies, Lattice pegging methods, cyclic diagram of operation of the dobbly mechanism.

**Jacquard:**


Shuttle-less Weaving: Study of special features of rapier, projectile, water-jet, Air-jet looms.

Study of above types of shuttle-less weaving machines with reference to: Types of weft supply creels, Types of weft tensioning devices, Weft feed system, Types of weft insertion systems, Different carrier breaking system, Consolidation of picking force in air jet picking systems. Weft mixing systems, Systems of weft beat up, Types of selvedges.

Introduction to textile printing - An overview of the printing process.

Selection of dyes/pigments/auxiliaries and textile substrate to suit the end use of the printed textile materials.

The constituents and characteristic of printing paste. Brief study of different binders, thickeners, solvents, discharging agents and other ingredients of printing paste.

Styles of printing – Direct, discharge, resist and special styles- chemical and mechanisms used for the above styles.

Methods of printing – Printing by Hand block, Roller, hand screen, semi-automatic screen, flat bed and rotary screen printing methods. Developments in printing machinery.

Transfer printing – Principle, mechanisms and continuous transfer printing – Transfer printing machinery.

The print paste preparation and preservation. Printing of natural and synthetic fibre fabrics with various classes of dyes/pigments.

Methods of print fixation – Drying, curing by dry heat, steam fixation etc.

Finishing process: An overview - objects and methods of finishing. Classification of various finishes – Various finishing chemicals used and their properties.
Calendering and various calendering machines used. Sanforization – principle and the process. Resin and anti-crease finish on cotton and protein fibre fabrics. Water repellent finishes, fire retardant and fire proof finishes.

Finishing of woollen materials, silk fabrics and blended products. Finishing of synthetic fibre fabrics - heat setting, de-lustering, anti-static, soil release, etc.

Introduction to textile testing and quality control. Sampling techniques. Moisture relation and testing. Fiber dimensions Viz., length, fineness, maturity and strength. Their technological importance and determination by various conventional and High Volume Instruments (HVI). FQI & its importance.

Study of various systems of yarn count & its measurements by various methods & instruments.


Yarn strength & its testing. Methods and principles of yarn strength testing.


Assessment of fabric quality for garment industry- Testing & Inspection.

Study of fabric cyclic properties like bending, shear, fatigue.

Estimation of color fastness of dyed fabrics.

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Part II: Discipline Oriented Section - 50 questions

Questions carrying one mark
(Objective/multiple choice, preferably involving numericals covering full syllabus)

**Chemical Engineering**

Process Calculations and Thermodynamics: Laws of conservation of mass and energy; use of tie components; recycle, bypass and purge calculations; degree of freedom analysis.

First and Second laws of thermodynamics and their applications; equations of state and thermodynamic properties of real systems; phase equilibria; fugacity, excess properties and correlations of activity coefficients; chemical reaction equilibria.

Momentum Transfer and Mechanical Operations: Fluid statics, Newtonian and non-Newtonian fluids, Bernoulli equation, Macroscopic friction factors, energy balance, dimensional analysis, shell balances, flow through pipeline systems, flow meters, pumps and compressors, packed and fluidized beds, elementary boundary layer theory, size reduction and size separation; free and hindered settling; centrifuge and cyclones; thickening and classification, filtration, mixing and agitation; conveying of solids.

Heat Transfer: Conduction, convection and radiation, heat transfer coefficients, steady and unsteady heat conduction, boiling, condensation and evaporation; types of heat exchangers and evaporators and their design.

Mass Transfer: Fick's law, molecular diffusion in fluids, mass transfer coefficients, film, penetration and surface renewal theories; momentum, heat and mass transfer analogies; stagewise and continuous contacting and stage efficiencies; HTU & NTU concepts design and operation of equipment for distillation, absorption, leaching, liquid-liquid extraction, crystallization, drying, humidification, dehumidification and adsorption.

Chemical Reaction Engineering: Theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, non-ideal reactors; residence time; non-isothermal reactors; kinetics of heterogeneous catalytic reactions; diffusion effects in catalysis.

Instrumentation and Process Control: Measurement of process variables; sensors, transducers and their dynamics, dynamics of simple systems, dynamics such as CSTRs, transfer functions and responses of simple systems, process reaction curve, controller modes (P, PI, and PID); control valves; analysis of closed loop systems including stability, frequency response (including Bode plots) and controller tuning, cascade, feed forward control.

Plant Design and Economics: Design and sizing of chemical engineering equipment such as
compressors, heat exchangers, multistage contactors; principles of process economics and cost estimation including total annualized cost, cost indexes, rate of return, payback period, discounted cash flow, optimization in Design.

Chemical Technology: Inorganic chemical industries; sulfuric acid, NaOH, fertilizers (Ammonia, Urea, SSP and TSP); natural products industries (Pulp and Paper, Sugar, Oil, and Fats); petroleum refining and petrochemicals; polymerization industries; polyethylene, polypropylene, PVC and polyester synthetic fibers.
VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

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Part II: Discipline Oriented Section

Questions carrying one marks
(Objective/multiple choice, preferably involving_numericals covering full syllabus)

**BIO-TECHNOLOGY**

1. BASICS OF UNIT OPERATIONS

2. FUNDAMENTALS OF MOMENTUM TRANSFER
Fluid definition, Classification, governing equations, Hydrostatic equilibrium, barometric equation, Pressure measurements, Manometric equation, Shear stress, Shear strain, Newton’s law, Fluid flow, Types of flow, Laminar and turbulent flow. Continuity equation, Energy balance equation, Bernoulli’s equation, Euler equation, Momentum balance, Flow through circular and non circular sections, Hagen-Poiseulles equations, Losses through pipe and fittings, Turbulent flow, and Friction factor.

3. BASIC BIOCHEMISTRY
Structure and properties of mono, di, and polysaccharides, structure and properties of fatty acids, neutral fats, phospholipids, glycolipids and steroids, structure and properties of aminoacids, peptides, and proteins. Biologically important peptides. Structure and properties of purines, pyrimidines, nucleosides, nucleotides, ribonucleic acids, nucleoprotein complexes.

4. FUNDAMENTALS OF CELL STRUCTURE AND FUNCTION

5. BASICS OF BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES
Rayleigh scattering, ultra centrifugation, visometry, crystallization, X-ray crystallography, neutron diffraction, NMR spectroscopy, electron microscopy, STM, AFM, luminescence, fluorimeter, falme, photometry, optical activity, CD, UV, IR, Laser Raman and ESR, EPR. Calorimetry, DSC, Spectrophotometry, Mass spectrometry, LC-MS, MALDI-TOF, Chromatography, Electrophoresis.

6. FUNDAMENTALS OF THERMODYNAMICS
7. BASIC GENETICS AND GENETIC ENGINEERING
Nature of genetic material, DNA replication, Mendelian Laws of inheritance, monohybrid and dihybrid inheritance, law of segregation and independent assortment, Gene interactions, supplementary genes, Complementary genes, Epistasis. Identification of genetic material, classical experiments - Hershey & Chase, Avery McLeod etc. Multiple alleles and groups antigens. Role of genes within cells, genetic code, genetic elements that control gene expression, method of creating recombinant DNA molecules, vectors in recombinant DNA technology, biology and salient features of vectors, types of vectors - plasmids, cosmids, phages and viruses. Gene transfer techniques, genetic engineering of plants and animals, structure and functions of T-DNA in the expression of genes, Ti plasmid mediated gene transfer.

8. INTRODUCTORY BIOINFORMATICS

9. BIOPROCESS PRINCIPLES
Concept of mole and Molecule, Composition, of mixtures of Solids, liquids and gases. Composition of mixtures and solutions- Percentage by weight, mole and Volume; Normality, Morality, Molality, and ppm, pH and pK Buffer Calculations. Outline of an integrated bioprocess and the various (upstream and downstream) unit operations involved in bioprocesses; generalized process flow sheets. Process flow sheet and unit operations in chemical and bioprocess industries; General material balance equation for steady and unsteady states. Basic concepts of Energy Balance.

Couples reactions and energy rise compounds, Reaction Stotichiometry, criteria of biochemical reaction equilibrium, equilibrium constant and standard free energy change, effect of temperature, pressure on equilibrium constants and other- factors affecting equilibrium conversion, liquid phase reactions, heterogeneous bioreaction equilibria, phase rule for reacting systems.

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Part II: **Discipline Oriented Section**

Questions carrying one marks
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**CHEMISTRY**

(Topics Studied up to the Bachelor Degree Level should be considered for setting the comprehensive questions in the subject)

1. **Periodic Properties** - Atomic radii – Ionization energy in groups and periods – Electron affinity Chemical Bonding.


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Part II: **Discipline Oriented Section** - 50 questions

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**Physics**

(Topics Studied up to the Bachelor Degree Level should be considered for setting the comprehensive questions in the subject)
(Topics Studied up to the Bachelor Degree Levels should be considered for setting the comprehensive questions in the subject)


3. **Waves Acoustics** – Progressive waves – Superposition – Doppler effect – Acoustics of
   Buildings – Fourier transforms – Ultrasonics.


5. **Electricity and Magnetism** – Electrostatics – Galvanometers - Measuring Instruments) -
   Alternating and Direct current – Generation and Analysis – Thermoelectricity –
   Electromagnetism.

6. **Atomic and Molecular Physics** – The electron – Atomic Models – Atomic spectra –

7. **Nuclear Physics** – The nucleus – Nuclear models - Mass spectrographs – Radioactivity –
   Accelerators – Nuclear detectors – Nuclear reactions - Cosmic ray - Mossbauer effect –
   Magnetic Resonance – Applications – Elementary Particles.

8. **Solid State Physics** - Relativity - Special and General Theories of relativity – Statistical
   Physics – Specific Heats of Solids – Band Theory of solids – Classification of solids -
   Electrical Conductivity in solids – Dielectric and Magnetic Properties – Specific Heats of
   Oscillators - Digital electronics – Superconductivity.

   wave equations. Solutions – Eigen values.

    Materials.

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Part II: **Discipline Oriented Section** - 50 questions

Questions carrying one marks

(Objective/multiple choice, preferably involving numericals covering full syllabus)

**MATHEMATICS**

*(FOR BACKGROUND OF M.SC.(MATHS)*

(Topics Studied up to the Bachelor Degree Level should be considered for setting the comprehensive questions in the subject)

1. **TRIGONOMETRY**

Trigonometric ratios and relations, simple problems. Complex numbers: Definition and properties, De moivre's theorem, roots of complex numbers

2. **INFINITTE SERIES**


3. **LINEAR ALGEBRA**

Matrices and determinants, Inverse of a matrix, rank of a matrix, consistency of a system of linear equations. Eigen values and eigen vectors

4. **CALCULUS**

a) **DIFFERENTIAL CALCULUS**: $n^{th}$ derivative of standard functions, polar curves, angle between polar curves. Partial differentiation, maximum and minimum for function of single and two variables. Curvature and radius of curvature, mean value theorems, Taylor’s and Maclaurin’s expansion for a function of single variable. Indeterminate forms.
b) **INTEGRAL CALCULUS**
   Tracing of standard curves. Beta and gamma functions. Length, Area, Volume using multiple integrals.

5. **DIFFERENTIAL EQUATIONS**
   Solutions of first order and first degree differential equations,

6. **APPLIED MATHEMATICS**
   a) Laplace Transforms, Fourier Series & Fourier Transforms
   b) **NUMERICAL METHODS**
      Solutions of algebraic and transcendental equations, finite differences and related problems, numerical differentiation and numerical integration, Numerical solution of ordinary and partial differential equations, application to Engineering problems.
   c) **STATISTICS AND PROBABILITY**
      Correlation and regression, analysis of variance.
      *Probability*: Axioms, Including Bayes theorem, conditional probability, probability distribution-Binomial poisson, normal, geometric and exponential distribution.

**TEXT BOOKS:**

2. Elementary Engineering Mathematics- Dr. B.S. Grewal
3. Advanced Engineering Mathematics – Erwin Kreyszig
4. Introduction to Numerical Analysis – S.S. Sastry

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Business Administration

Part I: Verbal Ability, Numerical Analysis Quantitative ability
Questions carrying one mark - 30 questions

Part III: Aptitude section

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<tr>
<th>Reading Comprehension data Sufficiency &amp; Data Interpretation, Logical Reasoning computer awareness</th>
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**Part II: Discipline Oriented Section**

Questions carrying one marks - 50 questions
(Objective/multiple choice)

**Business Administration**

**Module 1**

**Module 2**
Organization behaviour: nature: Learning, Personality: definition-traits-determinants. Perception; Meaning, factors influencing perception, perception and decision making.

**Module 3**
Marketing Management: Meaning-importance – Marketing management process- Marketing mix.

**Module 4**
Human Resource Management: definition, nature, scope-managerial and operative functions of HRM. Objections of HRM.

**Module 5**
Financial Management: Definition, scope, functions, objectives, Time value of money.

Latest Management concepts in all the above modules.
Polymer Science and Technology

- Fundamentals of polymer science- definition to polymer/macromolecules, copolymer, blends, composites, fibres, etc. Classification of polymers, functionality of monomers. Explain the terms crystallinity, amorphous, tacticity, stereoregularity, Tg/Tm, configuration/conformation.

- **Chemistry and Mechanism of Polymerization:**

- **Methods of Polymerization** - Bulk, solution, suspension, emulsion, solid phase, gas phase polymerizations

- **Molecular weight and size:** The concept of molecular weights (number average, weight average, viscosity average and z average molecular weight - definitions and mathematical expressions), molecular weight distribution (MWD) & its importance and polydispersity.

- Polymer properties – approach and the concept of chemical structure of polymers

- Polymer testing/characterization – density, bulk density, UTM, stress-strain curves (types), definition for tensile modulus, impact strength, thermal methods-DSC and TGA (basics), melt viscosity (MFI)

- Chemistry, properties and uses of some polymers – Types of polyethylene (LDPE & HDPE), nylons, PP, PS, PAN, PMMA, PET, PC, NR, SBR, epoxies

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Technical Aptitude Test
PhD (Architecture)

SYLLABUS

City Planning: Historical development of city planning, principles of city planning, new towns, survey methods, site planning and planning regulations and building bye laws.

Housing: Concept of shelter, housing design and policies, role of government agencies, finance and management.

Landscape Design: Principles of landscape design, landscape elements, materials, planning design.

Visual and Urban Design: Principles of visual composition, proportion, scale, rhythm, symmetry, asymmetry, balance of form and color, sense of place and space, division of space, focal point vista, visual survey.

History of Architecture: Indian - Indus valley, Vedic, Buddhist, Indo-Aryan, Dravidian and Mughal periods; European - Egyptian, Greek, Roman, Medieval, and Renaissance periods.

Development of Contemporary Architecture: Development and impact on society since industrial revolution, influence of modern art on architecture, works of national and international architects, post-modernism in architecture.

Planning Theory: Planning process, comprehensive planning, land use and density in residential and non-residential areas, central place theory, rank-size rule, settlement pattern, land utilization, and district level planning.

Techniques of planning: Application of remote sensing techniques in urban and regional planning, planning surveys, methods of preparation of urban and regional development plans, structure plans, strategy plans etc.; and site planning principles and design.

Part III: *Aptitude section*

- Reading Comprehension
- Data Sufficiency & Data Interpretation
- Logical Reasoning
- Computer awareness

- 20 questions