

Applied Mathematics – III

S.E. Sem. III [CHEM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs	100
Practical and Oral Exam	–	–
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. Laplace Transform

- Definition, properties of linearity, Laplace transform of elementary function, Properties of Laplace transform (First and Second Shifting property).
- Theorem on Laplace Transform

$$L\{t^n f(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u)du\right\}, L\{f(at)\}, L\left\{\frac{d}{dt} f(t)\right\} \text{ (with proof)}$$

2. Inverse Laplace Transform

- Definition, Inverse Laplace Transform by using partial fraction method, Convolution Theorem (without proof).
- Applications to solve boundary value problem involving ordinary differential equations with one independent variable, Applications to chemical engineering.

3. Laplace Transform and Matrices

- Laplace Transform of periodic functions, Heaviside unit step functions, Dirac delta function.
- Types of Matrices, Adjoint of Matrices, Inverse of Matrix.

4. Matrices

- Rank of Matrix, Elementary transformation of matrix, Linear dependent and independent of rows and columns of a matrix over a real field.
- Reduction of normal form, Homogeneous linear equations and non-homogenous equations, their consistency.

5. Complex Variable

- Functions of complex variable, Continuity (only statement), Derivability of a function, Analytic functions, C-R equations in Cartesian and polar (with proof), Harmonic functions.
- Orthogonal trajectories, Analytical and Milne-Thomson method to find $f(z)$.
- Mapping, Conformal mapping, Bilinear transformation, Cross ratio preservation property (with proof).

6. Bessels Equation

- Bessels Equation and functions (without proof), Equations reducible to Bessel form, Method of solving the equations and conditions for the four types of Bessels and Modified Bessels equations and functions.
- Recurrence Relations for Bessels functions. Applications to Chemical engineering e.g., heat transfer for an extended surface.

Reference :

1. Mathematical Methods in Chemical Engineering (Jenson V.G. & Jeffrey, G.V.) – Academic Press, 1970.
2. Mathematical Methods in Chemical Engineering (Pushpaganam S.) – Prentice Hall of India 1998.
3. A text book of Applied Mathematics (*P.N. & J.N. Wartikar*) – Vol. 1 & 2
4. Laplace Transforms (*Lipschutz S.*) – Schaum's Outline Series.
5. Higher Engineering Mathematics (*Dr. B. S. Grewal*)



Advanced Chemistry – I
S.E. Sem. III [CHEM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs	100
Practical Exam	–	25
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. Chemical Bonding and Molecular Structures

Ionic and covalent bonds, Exceptions of Octet rule, Resonance, Variable Valency, Hydrogen bond, Valence band-Theory, Crystal field theory, Ligand field theory, Structures of molecules with lone pair electrons, H₂O, MH₃, BRF₃, SF₄, PCl₃, PCl₅, Molecular orbital theory, Non-bonding and antibonding orbitals, LCAO method, VSEPR theory, Molecular orbital structures of homonuclear and heteronuclear molecules H₂, HC₂, BC₂, B₂, C₂, N₂, O₂, F₂, CO, HF, NO₂. Metallic band, Bloch's theory, Pauling theory.

2. Co-ordination Chemistry

Co-ordination dative band, complexions, co-ordinations number or ligancy, Werner's co-ordination theory, Effective Atomic number, Nomenclatures and isomerism in co-ordination compounds with respect to co-ordination number 4 and 6. Application of CFT to tetrahedral and octahedral complexes, Drawbacks of CFT, MOT as applied to the octahedral complexes of Fe and Ni, Measurement of CFSE (10 D₂), Numerical based on EAN and 10 D₂ measurement.

3. Organometallic Compounds

- Chemistry of Fe-carbonyls with respect to preparation, properties, structure and bonding.
- Bi-inorganic Chemistry of Iron : Classification of biomolecules containing metalions, Bio-Chemistry of proteins containing Cu, Fe and Zm, Chemistry of cytochromes and their applications, O₂ atom transfer reactions of biomolecular reaction containing Fe.

4. Dyes and Drug

- Dyes : Sensation of colour, colour and constitution, nomenclature, classification based on chemical composition and mode of application. Synthetic and uses of (1) Fast Printing Green, (2) Methyl Orange, (3) Methyl red, (4) Congored, (5) Alizarin.
- Drugs : Synthesis and uses of (1) Ibuprofen, (2) Aspirin, (3) Vitamin – C, (4) P-nitro aniline, (5) O-Chlorobenzoic acid.

5. Electrochemistry

Introduction – conductance, Effect of temperature on conductivity, mobility of ions, transport number and its determination, theories of electrolytic conductance, Debye Huckel theory of strong electrolytes, Concentration cells with and without transference, standard cells, standard electrode potential, reference electrode, Use of EMF measurements and other techniques for determination of dissociation constancies of acids and bases, solubility product, hydrolysis constand, hydrogenion concentration, theory of acid base indicators, Electrometric titrations.

- 6. Reactions, mechanisms and Industrial applications of Pinacol-Pinacolone rearrangement, Michel reaction, Deckmann Condensation, Benzil-Benzilic acid rearrangement, Beckmann, Darzan reactions, Fischer-Indole synthesis, Mecrmin pondroff reaction and Oppenauer oxidation.**



Computer Application

S.E. Sem. III [CHEM]

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Term Work	–	25

SYLLABUS

1. Introduction

- Software Evolution, Algorithm, Flowchart, Approaches to Modular Design, Software Development Life Cycle and Object Oriented Paradigm.
- Opening and Closing Data Files (File Access Options), Creating a Data File and Accessing a Data File.

2. Basic Concepts in Data Base Management Systems (DBMS)

- Database System Application, File Structure Versus DBMS, Database Languages, Database user and administrator, E-R Diagrams and Reduction of E-R to the Relational scheme.
- **Introduction to Visual Programming** : Case study in Visual Basic : Form Designing by active Data Object (ADO), Open Database Connectivity (ODBC) with Excel and Application to the Chemical Engineering Problem.

3. Introduction to MATLAB

- Introduction; Tutorial Lessons : A minimum MATLAB Session, Creating and working with Arrays of numbers, creating and printing simple plots, Creating, Saving and Executing a script file, Creating and executing a function file, Working with files and directories and Publishing reports. Interactive Computations : Matrices and Vectors, Matrix and Array Operations, Vectorization, Command line functions, Using built-in functions and on-line help, Saving and loading data and Plotting simple graphs; Programming in MATLAB : Scripts and Functions; Applications; Graphics; 2-D and 3-D plots.

4. Introduction to Robotics

- Automation, Specification of Robot NC and CNC Machine, Advantages, Disadvantages, Basic Concepts of Artificial Intelligence, Expert System and its applications to Chemical Engineering.

5. Numerical Methods

- Solution of Algebraic and Transcendental Equations, Bisection Method, Method of False Position, Iteration Method, Secant Method, Newton Raphson Method, Muller's Method, The Quotient Difference Method and Solution of Systems Non-linear Method.

6. Interpolation

- Error in Polynomial Interpolation, Finite Differences, detection of Errors by use of Difference Tables, Newton's Formula for interpolation, Central Difference Interpolation Formula, Practical Interpolation, Interpolation with Unevenly spaced points, Divided Differences and their properties, Inverse Interpolation and Double Interpolation.
- **Curve Fitting, Cubic Splines and Approximation** : Least Squares Curve Fitting Procedures, Data Fitting with Cubic Splines, Approximation of Functions.

Reference :

1. Electrical Machines (*I.J.Nagrath, D.P. Kothari*) – Tata McGraw Hill, 2nd edition, New Delhi, 1997.
2. Fundamental of Electrical Engineering (*Bobrow, Leonard S.*), Oxford University Press, New Delhi, 2003.
3. Electrical Machinery (*Dr. P. S. Bhimbra*) – 5th edition, Khanna Publisher, New Delhi, 1997.
4. The performance and Design of Alternating Current Machines (*M. G. Say*) – 3rd edition, CBS Publisher and Distributor, Delhi, 1983.
5. FHP Mototors (*Openshaw Taylor*) – Addison Wesley, 1976.
6. Electronics Devices and Circuits (*J. Millman & C. C. Halkias*) – Tata McGraw Hill, 1994.
7. Electric Machinery and Transformers (*Bhang S. Guru & Huseyin R. Hiziroglu*) – Oxford University Press, New Delhi, 2000.
8. Electronic Devices and Circuits and Introduction (*A. Mattershead*) – Prentice Hall of India, 1993.
9. Switchgear and protection (*Sunil S. Rao*) – 9th edition, Khanna Publishers, Delhi, 1988.
10. Electrical Power (*S. L. Uppal*) – 13th edition, Khanna Publishers, Delhi, 1988.



Electrical and Electronics Engineering

S.E. Sem. III [CHEM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs	100
Practical Exam	–	25
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. DC Machines

- DC Generator : Constructional details, types (shunt, series and compound), principle of working, emf equation, characteristics.
- DC Motor : Motoring action, significance of back emf, torque and speed equations, torque-armature current, speed-armature current and torque-speed characteristics of different types of motors, speed control, starter, applications.

2. Induction Motor

Rotating magnetic field, construction and principle of operation, slip, rotor frequency, torque-slip characteristic, relationship between slip and rotor copper loss, speed control, starting methods, motor ratings.

3. Fractional Horse Power Motors

Construction and principle of operation of single phase induction motor, types of single phase induction motor (resistance split phase, capacitance split phase) and their applications. Shaded pole induction motor.

4. Synchronous Machines

- Alternator : Constructional features and principle of operation, synchronous speed, regulation.
- Synchronous Motor : Principle of operation, method of starting and applications.

5. Switchgear, Measuring Instruments and Utilization of Power

Autotransformer, Construction and principle of current and potential transformer, Introduction to relays, contactors, isolators and HRC fuses. Principle and working of circuit breakers. Introduction of induction and Dielectric heating.

6. Electronics

Diode rectifiers and filter, transistor characteristics and its three configurations (CE, CB, CC), Transistor as an amplifier, Opto-electronic devices (e-LDR, Photo transistors, Photodiode), SCRs (Silicon Controlled Rectifier) and its application to control speed of motors. Cathodes Ray Oscilloscope. A preliminary level treatment for introduction to digital electronics (number system and basic gates). Basic architecture block diagram of microprocessor 8085.

References :

1. Industrial Chemistry (*B.K. Sharma*) – Goel Publishing House (2006)
2. Vogel's Textbook of Quantitative Chemical Analysis (*Gogel A. L.*) – ELS Longman (1991).
3. Text book of Practical Organic Chemistry (*Vogel*).
4. A Textbook of physical chemistry, (*Kapoor*) – Vol. 1, 2 & 3, MacMillan India Ltd. (1991).
5. A Textbook of physical chemistry (*Glasston Samuel*) – MacMillan India Ltd. (1991).
6. Physical Chemistry (*Castellan G.W., Addison Heslay*) – Haroda Students Edition (1994).
7. Basic Physical Chemistry (*Mooro*) – PHI.
8. Principals of Physical Chemistry (*Puri and Sharma*)
9. Advanced Chemistry (*Mathews*)
10. Organic Chemistry (*Finar I.C.*) – Vol. 1 & 2, ELBS Longman (1994)
11. Organic Chemistry (*Morrison & Boyd PHI Ltd.*)
12. Instrumental Methods of Analysis (*B.K. Sharma*) – Goel Publishing House.
13. A guide book to mechanism inorganic chemistry (*Skyobpotor*) –Longman
14. A primer to mechanism inorganic chemistry (*Skyobpotor*) –Longman
15. Organic Reactions and Reagents (*O.P. Agrawal*) – Goel Publishing House
16. Organic Reactions and Reagents (*Chatwaal*)
17. Instrumental methods of Analysis (*Willard, Merrif*) – CBS Publishers and distributors.

