## SYLLABUS FOR COMPUTER SCIENCE AND ENGINEERING

### MATHEMATICS (50 Marks)

**Unit-I: Matrices**
Matrices of 3rd order: Types of matrices-Algebra of matrices-Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Properties-Laplace's expansion-singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix-System of linear equations in 3 variables-Solutions by Crammer's rule, Matrix inversion method,-Gauss-Jordan methods.
**Partial Fractions:** Resolving a given rational function into partial fractions**.**

**Unit–II: Trigonometry**
Properties of Trigonometric functions – Ratios of Compound angles, multiple angles, sub multiple angles – Transformations of Products into sum or difference and vice versa – Simple trigonometric equations – Properties of triangles – Inverse Trigonometric functions.
**Complex Numbers**: Properties of Modulus, amplitude and conjugate of complex numbers, arithmetic operations on complex number—Modulus-Amplitude form (Polar form)-Euler form (exponential form)-Properties- De Movire's Theorem and its applications.

**Unit–III: Analytical Geometry**
Straight Lines – different forms of Straight Lines, distance of a point from a line, acute angle between two lines, intersection of two non- parallel lines and distance between two parallel lines. Circles-Equation of circle given center and radius, given ends of diameter-General equation-finding center and radius. Standard forms of equations of Parabola, Ellipse and Hyperbola – simple properties.

**Unit–IV: Differentiation and its Applications**
Functions and limits – Standard limits – Differentiation from the First Principles – Differentiation of sum, product, quotient of functions, function of function, trigonometric, inverse trigonometric, exponential, logarithmic, Hyperbolic functions, implicit, explicit and parametric functions – Derivative of a function with respect to another function-Second order derivatives – Geometrical applications of the derivative (angle between curves, tangent and normal) – Increasing and decreasing functions – Maxima and Minima (single variable functions) using second order derivative only – Derivative as rate measure -Errors and approximations - Partial Differentiation – Partial derivatives up to second order – Euler's theorem.

**Unit–V: Integration and its Applications**
Indefinite Integral – Standard forms – Integration by decomposition of the integrand of trigonometric, algebraic, exponential, logarithmic and Hyperbolic functions – Integration by substitution – Integration of reducible and irreducible quadratic factors – Integration by parts – Definite Integrals and properties, Definite Integral as the limit of a sum – Application of Integration to find areas under plane curves and volumes of Solids of revolution – Mean and RMS value.

**Unit–VI: Differential Equations**
Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of the type first order, first degree, variable-separable, homogeneous equations, exact, linear differential equation of the form $dy/dx + Py = Q$, Bernoulli's equation, nth order linear differential equation with constant coefficients both homogeneous and non homogeneous and finding the Particular Integrals for

the functions $e^{ax}$, $x^m$, sin ax, cos ax.

### Unit–VII: Laplace Transforms and Fourier series
Laplace Transforms and Inverse Laplace Transforms of Elementary functions. Shifting Theorems of LTs and ILTs.
Define Fourier series, Euler's Formulae Over the interval (C, C+2π).Even and odd functions and their Fourier series

### Unit–VIII: Probability and Statistics
Define Probability, addition Theorem, conditional Probability, Mean, Median, Mode, Mean deviation and standard deviation.

## PHYSICS (25 Marks)

**Unit-I: Units and dimensions:** Physical quantity-fundamental and derived physical quantities-units-fundamental and derived units-SI units-multiples and sub-multiples in SI units-advantages of SI units-dimensions and dimensional formulae-dimensionless quantities- applications and limitations of dimensional analysis-problems.

### Unit-II: Elements of vectors:
Scalar and vector quantities-examples-types of vectors- addition and subtraction of vectors-triangle law-parallelogram law and its cases-polygon law- resolution of a vector-unit vectors (i, j, k)-dot product and cross product of two vectors- characteristics of dot and cross products-examples-problems.

### Unit-III: Kinematics and Friction
Equations of motion-acceleration due to gravity-equations of motion under gravity- expressions for maximum height, time of ascent, time of descent, time of flight, velocity on reaching the point of projection in vertical motion--motion of a body projected from the top of a tower-projectile motion-examples-horizontal and oblique projections-expressions for maximum height, time of ascent, time of flight, horizontal range, problems. Friction- causes and types of friction-normal reaction-laws of friction-coefficients of friction- angle of friction-methods of reducing friction-advantages and disadvantages of friction- motion of a body over a rough horizontal surface, a smooth inclined plane and a rough inclined plane–problems.

### Unit-IV: Work, Power and Energy
Work, power and energy-definitions and units-potential and kinetic energies-examples and expressions-work-energy theorem-law of conservation of energy-problems.

### Unit-V: Simple harmonic motion and Sound
Definition-conditions of SHM-examples of SHM-expressions for displacement, velocity, acceleration, time period, frequency and phase of SHM-time period of a simple pendulum-seconds pendulum-problems. Sound-musical sound and noise-noise pollution-Effects and methods of control of Noise Pollution-Beats and echo's-problems-Doppler effect – Explanation, and Applications - Acoustics of buildings-Reverberation-Sabine's formula- characteristics of a good building-problems.

### Unit-VI: Heat and Thermodynamics
Expansion of gases-Boyle's law-Absolute scale of temperature-Charles laws-Ideal gas equation-Universal gas constant and its value-SI Units-problems-external work done by a gas-isothermal process-adiabatic process-first law of thermodynamics and its applications to

isothermal process and adiabatic process-two specific heats of a gas-relation between Cp and Cv-problems-second law of thermodynamics and its applications.

## Unit-VII: Modern physics
Photoelectric effect – explanation and its laws-applications of photoelectric effect (photocell)-Einstein's photoelectric equation – critical angle and total internal reflection – optical fibers - principle, working , types and applications-concept of super conductivity – its properties and applications.

## CHEMISTRY (25 Marks)

### Unit – I: Fundamentals of chemistry:
**Atomic structure**: Introduction-Fundamental particles – Bohr's theory – Quantum numbers – Aufbau principle – Hund's rule – Pauli's exclusion principle- Electronic configurations of elements up to atomic number 20, shapes of **s, p, d** orbital's.
**Chemical Bonding**: Introduction – types of chemical bonds – Ionic bond taking example of NaCl and MgO –characteristics of ionic compounds and covalent bond taking example $H_2$, $O_2$, $N_2$, HCl, characteristics of covalent compounds-Coordinate covalent bond- Metallic bond .
**Oxidation-Reductions**:concepts of Oxidation-Reduction ,Oxidation number and its calculations, differences between oxidation number and Valency

### Unit-II: Solutions:
Introduction solution classification of solutions, solute, solvent, concentration, mole concept,–Molarity,–Normality, equivalent weight using acids, bases and salts, numerical problems on Molarity and Normality.

### Unit-III: Acids and Bases:
Introduction – theories of acids and bases – Arrhenius, Bronsted – Lowry theory – Lewis acid base theory – Ionic product of water - $p^H$ and related numerical problems – buffers solutions – Applications.

### Unit – IV: Principles of Metallurgy:
Characteristics of metals and distinction between metals and non- metals. Definitions of metallurgy , ore, gangue, flux, slag –concentration of ore-hand picking, levigation, froth floatation – extraction of crude metal – roasting calcination, smelting – alloys – composition and uses of brass, German silver and nichrome.

### Unit-V: Electrochemistry:
Conductors, insulators, electrolytes - Arrhenius theory of electrolytic dissociation – electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electro chemical series –emf and numerical problems on emf of a cell.

### Unit –VI: Corrosion:
Introduction - factors influencing corrosion - electrochemical theory of corrosion- composition cell, stress cell and concentration cells– rusting of iron and its mechanism – prevention of corrosion by (a) coating methods, (b) cathodic protection (sacrificial and impressive voltage methods).

### Unit-VII: Water Technology:
Introduction –soft and hard water – causes of hardness – types of hardness –disadvantages of hard water – degree of hardness, units and Numerical problems– softening methods – permutit process – ion exchange process – qualities of drinking water – municipal treatment of water for drinking purpose.- Osmosis and reverse Osmosis, advantages of reverse Osmosis.

### Unit-VIII: Polymers:
Introduction – polymerization – types of polymerization – addition , condensation polymerization with examples – plastics – types of plastics – advantages of plastics over traditional materials – Disadvantages of using plastics ,thermo plastics and thermo setting plastics– differences between thermo plastics and thermo stetting plastics- preparation and

uses of the following plastics: 1. Polythene, 2. PVC, 3. Teflon, 4. Polystyrene, 5.Urea formaldehyde – Rubber – natural rubber – processing from latex –Vulcanization – Elastomers – Butyle rubber Buna-s, Neoprene rubber and their uses.

**Unit-IX: Fuels:** Definition and classification of fuels based on physical state and occurrence – characteristics of good fuel - composition and uses of gaseous fuels. (a) Water gas, (b) producer gas, (c) natural gas, (d) coal gas, (e) bio gas, (f) acetylene.

**Unit-X: Environmental Chemistry:** Introduction – environment –understand the terms lithosphere, hydrosphere, atmosphere bio sphere, biotic component, energy component pollutant, receptor, sink, particulate, DO, BOD, Threshold limit value, COD- Air pollution - causes-Effects-Forest resources ,uses and over exploitation ,deforestation acid rain, green house effect –ozone depletion – control of Air pollution – Water pollution – causes – effects – control measures. Renewable and Non Renewable energy sources – concept of ecosystem –producers, consumers and decomposers – Biodiversity ,threats to Biodiversity .

## COMPUTER SCIENCE AND ENGINEERING (100 Marks)

**1. Digital Electronics:** Logic Families: TTL, ECL, MOS – Logic gates AND,OR,NOT,NOR,NAND and XOR – Boolean Expressions – K-map –Combinational Circuits – Flip-flops – registers – Counters – decoders, multiplexers and semiconductor memories.

**2. Microprocessors**: 8086 microprocessor – architecture, segmentation concepts – register organization – addressing modes – instruction set – preliminary features of 80286, 80386 and 80486.

**3. Computer Organization:** Functional blocks of CPU – Fixed point, floating point number representations –instructions – addressing modes – stored program concept – instruction execution – memory hierarchy – virtual memory, associative memory – cache memory – I/O organization – methods of data transfer – programmed I/O, DMA, Interrupts – IOP.

**4. C and Data Structures:** Data types, storage classes, operators and expressions – control statements – functions, parameter passing – arrays and pointers, structures, unions – type definitions – pre processor directive statements – files – Data Structures – Linked Lists – queues and stacks – trees – sorting : bubble, selection, quick and merge sorts - Searching : linear and binary search techniques.

**5. Computer Networks:** OSI reference model, TCP/IP reference model –Network topologies: Bus, Ring, Star, Mesh, Hybrid – LAN components – Coaxial, twisted pair, optical fiber cables and connectors – LAN devices - repeaters, hubs, switches, NIC, Higher-Layer protocols: HTTP, FTP, SMTP, Telnet – TCP/IP addressing scheme – IP address classes – IP sub netting.

**6. Operating Systems:** Operating system concepts, functions, types, system calls – process management – CPU scheduling algorithms – deadlocks – memory management – overlays, paging, segmentation, virtual memory, page replacement algorithms – disk scheduling- free space management – allocation methods – disk scheduling algorithms.

**7. RDBMS:** Need of database systems, data independence, Data models, E-R model – structure of relational database – normal Forms : 1st, 2nd, 3rd and BCNF – SQL – data types, operators, DDL and DML commands – views, sequences, synonyms, indexes and clusters – PL/SQL – data types, control structures, cursor management, exceptions, functions, procedures and packages.

**8. Object Oriented Programming Through C++:** Concept of OOPs – classes and objects – Constructors and destructors – arrays, pointers, references – function overloading and operator overloading – inheritance – virtual functions – friend functions –this pointer – i/o manipulators – file and i/o functions.

**9. Java Programming:** Java – data types, variables, operators, arrays – Classes and objects – methods – constructors – overloading –inheritance - Visibility mode – packages – interfaces – multithreading – exception handling – applets.

**10. Internet Programming** : Internet  fundamentals – HTML, tags, attributes, formatting text – Java  script –data types, operators – control structures – procedures, functions and arrays –  PHP – data types, variables, operators, control structures, arrays, functions, concept of accessing databases.

* * *

# MODEL QUESTIONS FOR COMPUTER SCIENCE AND ENGINEERING

## MATHEMATICS

1. If $\begin{bmatrix} x & 1 & 1 \\ 2 & 3 & 4 \\ 1 & 1 & 1 \end{bmatrix}$ is a singular matrix, then the value of x is.

   1) -4      2) -3      3) -2      4) 1

2. The number of solutions of the equation $\tan^2 \theta = \frac{1}{3}$ are

   1) 2      2) 3      3) 4      4) None

3. The focus of the parabola $y^2 - x - 2y + 2 = 0$ is

   1) $(\frac{1}{4}, 0)$      2) $(1, 2)$      3) $(\frac{3}{4}, 1)$      4) $(\frac{5}{4}, 1)$

4. $\int_0^{\frac{\pi}{2}} \log \tan x \, dx =$

   1) 1      2) 0      3) 2log2      4) none

## PHYSICS

1. Dimensional formula for Energy is

   1) $MLT^{-2}$      2) $ML^2T^{-2}$      3) $ML^2T^2$      4) $MLT^2$

2. A body is thrownup vertically with a velocity of 19.6m/s .The maximum height reached by the body is(g=9.8m/s$^2$)

   1) 19.6m      2) 19.6m/s      3) 19.8m      4) 19.8m/s.

3. Gases obeys Boyle's law
   1) at high temperature and low pressures only
   2) at low temperature and high pressures only
   3) at high temperature and high pressures only
   4) at all temperatures and all pressures

4. A workdone by a man in carrying a load of 30kg over his head when he travels a distance 5m in horizontal direction is (g=9.8m/s$^2$)

   1) 1470J      2) 0 J      3) 1470m      4) 150 J

## CHEMISTRY

1. Which of the following orbital has less energy
   1) 3P      2) 3d      3) 4d      4) 4f

2. Which of the following element has stable electronic configuration?
   1) H      2) He      3) Li      4) Be

3. The pH of 0.001M NaOH is
   1) 1      2) 3      3) 11      4) 14

4. Brass is an alloy of
   1) Cu +Sn      2) Cu +Zn      3) Cu +Zn +Ni      4) Fe +Cr + Ni

# COMPUTER SCIENCE AND ENGINEERING

1. Which of the sets of LOGIC GATES are designated as UNIVERSAL GATES
   1) NOR, NAND                    2) XOR, NOR, NAND
   3) OR, NOT, AND                 4) NOR, NAND, XOR

2. The complexity of Binary Search algorithm
   1) O (n)          2) O (nlogn)          3) O(logn)          4) O($n^2$)

3. The postfix equivalence of the prefix *+ab-cd is
   1) ab+cd-*        2) abcd+-*            3) ab+cd*-          4) ab+-cd*

4. _____ are the devices that operate at the network layer of the OSI model for forwarding the packets over WAN
   1) Hubs           2) Bridges           3) Switches        4) Routers

* * *