PHYSICS

1. Circular motion.
Angular displacement, Angular velocity and angular acceleration, Relation between linear velocity and angular velocity, Uniform circular motion, Radial acceleration, Centripetal and centrifugal forces, Banking of roads, Vertical circular motion due to earth's gravitation, Equation for velocity and energy at different positions of vertical circular motion. Kinematical equations for circular motion in analogy with linear motion.

2. Gravitation.
Newton's law of gravitation, Projection of satellite, Periodic time, Statement of Kepler's laws of motion, Binding energy and escape velocity of a satellite, Weightlessness condition in orbit, Variation of 'g' due to altitude, lattitude, depth and motion, Communication satellite and its uses.

3. Rotational motion
Definition of M.I., K.E. of rotating body, Rolling motion, Physical significance of M.I., Radius of gyration, Torque, Principle of parallel and perpendicular axes, M.I. of some regular shaped bodies about specific axes, Angular momentum and its conservation.

4. Oscillations
Explanation of periodic motion, S.H.M., Differential equation of linear S.H.M. Projection of U.C.M. on any diameter, Phase of S.H.M., K.E. and P.E. in S.H.M., Composition of two S.H.M.'s having same period and along same line, Simple pendulum, Damped S.H.M.

5. Elasticity
General explanation of elastic property, Plasticity, Deformation, Definition of stress and strain, Hooke's law, Poisson's ratio, Elastic energy, Elastic constants and their relation, Determination of 'Y', Behaviour of metal wire under increasing load, Applications of elastic behaviour of materials.

6. Surface tension
Surface tension on the basis of molecular theory, Surface energy, Surface tension, Angle of contact, Capillarity and capillary action, Effect of impurity and temperature on surface tension.

7. Wave motion

Simple harmonic progressive waves, Reflection of transverse and longitudinal waves, Change of phase, Superposition of waves, Formation of beats, Doppler effect in sound. 8. Stationary waves Study of vibrations in a finite medium, Formation of stationary waves on string, Study of vibrations of air columns, Free and Forced vibrations, Resonance.

8. Stationary waves

Study of vibrations in a finite medium, Formation of stationary waves on string, Study of vibrations of air columns, Free and Forced vibrations, Resonance.

9. Kinetic theory of gases and Radiation

Concept of an ideal gas, Assumptions of kinetic theory, Mean free path, Derivation for pressure of a gas, Degrees of freedom, Derivation of Boyle's law, Thermodynamics- Thermal equilibrium and definition of temperature, 1st law of thermodynamics, 2nd law of thermodynamics, Heat engines and refrigerators, Qualitative idea of black body radiation,Wein's displacement law, Green house effect, Stefan's law, Maxwell distribution, Law of equipartition of energy and application to Specific heat capacities of gases.

10. Wave theory of light

Wave theory of light, Huygens' Principle, Construction of plane and spherical wave front, Wave front and wave normal, Reflection at plane surface, Refraction at plane surface, Polarisation, Polaroids, Plane polarised light, Brewster's law, Doppler effect in light.

11. Interference and diffraction

Interference of light, Conditions for producing steady interference pattern, Young's experiment, Analytical treatment of interference bands, Measurement of wavelength by biprism experiment, Diffraction due to single slit, Rayleigh's criterion, Resolving power of a microscope and telescope, Difference between interference and diffraction.

12. Electrostatics Gauss'

Theorem proof and applications, Mechanical force on unit area of a charged conductor, Energy density of a medium, Dielectrics and electric polarisation, Concept of condenser, Capacity of parallel plate condenser, Effect of dielectric on capacity, Energy of charged condenser, Condensers in series and parallel, van-deGraaff generator.

13. Current electricity

Kirchhoff's law, Wheatstone's bridge, Meter bridge, Potentiometer.

14. Magnetic effects of electric current

Ampere's law and its applications, Moving coil galvanometer, Ammeter, Voltmeter, Sensitivity of moving coil galvanometer, Cyclotron.

15. Magnetism

Circular current loop as a magnetic dipole, Magnetic dipole moment of revolving electron, Magnetisation and magnetic intensity, Dia-magnetism, Para-magnetism, Ferro-magnetism on the basis of domain theory, Curie temperature.

16. Electromagnetic inductions

Laws of electromagnetic induction, proof of, $e = -d\emptyset$ dt Eddy currents, Self induction and mutual induction, Need for displacement current, Transformer, Coil rotating in uniform magnetic induction, Alternating currents, Reactance and impedance, LC oscillations (qualitative treatment only) Power in a.c circuit with resistance, inductance and capacitance, Resonant circuit, Wattless current, AC generator.

17. Electrons and photons

Photoelectric effect, Hertz and Lenard's observations, Einstein's equation, Particle nature of light.

18. Atoms, Molecules and Nuclei

Alpha particle scattering experiment, Rutherford's model of atom. Bohr's model, Hydrogen spectrum, Composition and size of nucleus, Radioactivity, Decay law, mass, energy relation, mass defect, B.E. per nucleon and its

variation with mass number, Nuclear fission and fusion, de Broglie hypothesis, Matter waves – wave nature of particles, Wavelength of an electron, Davisson and Germer experiment, Continuous and characteristics X-rays.

19. Semiconductors

Energy bands in solids, Intrinsic and extrinsic semiconductors, P-type and Ntype semiconductor, P-N junction diode, I-V characteristics in forward and reverse bias, Rectifiers, Zener diode as a voltage regulator, Photodiode, Solar cell, I-V characteristics of LED, Transistor action and its characteristics, Transistor as an amplifier (CE mode), Transistor as a switch, Oscillators and Logic gates (OR, AND, NOT, NAND, NOR)

20. Communication systems

Elements of communication system, bandwidth of signals, bandwidth of transmission medium, Need for modulation, Production and detection of an amplitude modulated wave, space communication, Propagation of electromagnetic waves in atmosphere.

CHEMISTRY

Unit 1: Solid State

Classification of solids based on different forces; molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea), unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties, Band theory of metals, conductors and semiconductors and insulators and n and p type semiconductors.

Unit 2: Solutions and colligative properties

Types of solutions, expression of concentration of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties –relative lowering of vapor pressure, Raoult's law elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass. Van't Hoff factor and calculations involving it.

Unit 3: Chemical thermodynamics and energetic

Concepts of system, types of systems, surroundings. Work, heat, energy, extensive and intensive properties, state functions. First law of thermodynamics – internal energy and enthalpy, Hess' law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation. Phase transition, ionization and solution and dilution Introduction of entropy as a state function, free energy change for spontaneous and non spontaneous processes, and equilibrium constant. Second and third law of thermodynamics.

Unit 4: Electrochemistry

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell –electrolytic

and galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, fuel cells; corrosion. Relation between Gibb's energy change and emf of a cell.

Unit 5: Chemical kinetics

Rate of reaction (average and instantaneous), factors affecting rate of reaction; concentration, temperature, catalyst; order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment). Activation energy, Arrhenius equation.

Unit 6: General principles and processes of isolation of elements

Principles and methods of extraction – concentration, oxidation, reduction electrolytic method and refining; occurrence and principle of extraction of aluminium, copper, zinc and iron

Unit 7: p-Block elements

Group 15 elements: General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; nitrogen – preparation, properties and uses; compounds of nitrogen; preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only); Phoshorous-allotropic forms; compounds of phosphorous; preparation and properties of phosphine, halides (PCl_3, PCl_5) and oxoacids (elementary idea only).

Group 16 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; dioxygen; preparation, properties and uses;

Classification of oxides, simple oxides; Ozone.

Sulphur – allotropic forms; compounds of sulphur; preparation, properties and uses of sulphur dioxide; sulphurc acid; industrial process of manufacture, properties anduses, oxoacids of sulphur (structures only).

Group 17 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens; preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structure only).

Group 18 elements: General introduction, electronic configuration. Occurrence, trends in physical and chemical properties, uses.

Unit 8: d and f Block Elements d-Block Elements –

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, color, catalytic property, magnetic properties, interstitial compounds, alloy formation preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

f-Block elements

Lanthanoids – Electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences.

Actinoids – Electronic configuration, oxidation states. Comparison wit lanthanoids.

Unit 9: Coordination compounds

Coordination compounds – Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding; Werner's theory, VBT, CFT. isomerism, (structural and stereo) importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

Unit 10 : Halogen derivatives of alkanes (and arenes)

Haloalkanes :Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions. Stability of carbocations, R-S and d-l configuration

Haloarenes : Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only) stability of carbocations, R-S and d-l configurations. Uses and environmental effects of – dichloromethane, thrichloromethane, tetrachloromethane, iodoform, freons, DDT.

Unit 11 : Alcohols, phenols and ethers Alcohols :

Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses of methanol and ethanol.

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electro phillic substitution reactions, uses of phenols.

Ethers : Nomenclature, methods of preparation, physical and chemical properties, uses.

Unit 12 : Aldehydes, ketones and carboxylic acids Aldehydes and ketones : Nomenclature, nature of carbonyl group, methods of preparation. Physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.

Carboxylic acids :Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Unit 13: Organic compounds containing nitrogen

Nitro compounds- General methods of preparation and chemical reactions

Amines : Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Cyanides and isocyanides: Will be mentioned at relevant places in context.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Unit 14: Biomolecules Carbohydrates:

Classification (aldoses and ketoses), monosaccahrides d-l configuration (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen), importance. Proteins: Elementary idea of α -amino acids, peptide, linkage, polypeptides, proteins; structure of amines-primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation ofproteins; enzymes. Lipids and hormones (elementary idea) excluding structure, their classification and functions. Vitamins: Classification and functions. Nucleic acids: DNA and RNA

Unit 15: Polymers

Classification – natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers; natural and synthetic like polythene, nylon, polyesters, bakelite, and rubber. Biodegradable and non biodegradable polymers.

Unit 16: Chemistry in everyday life :

Chemicals in medicines : analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines elementary idea of antioxidants
Chemicals in food : Preservatives, artificial sweetening agents.
Cleansing agents : Soaps and detergents, cleansing action.

BIOLOGY

Unit 1: Genetics and Evolution:

Chapter 1 – Genetic Basis of Inheritance:

Mendelian inheritance. Deviations from Mendelian ratio (gene interaction-incomplete dominance, co-dominance, multiple alleles and Inheritance of blood groups), Pleiotropy, Elementary idea of polygenic inheritance.

Chapter 2 – Gene: its nature, expression and regulation:

Modern concept of gene in brief-cistron, muton and recon.

DNA as genetic material, structure of DNA as given by Watson and Crick's model, DNA.

Packaging, semi conservative replication of eukaryotic DNA

RNA: General structure types and functions.

Protein Synthesis; central dogma, Transcription; Translation-Genetic Code, Gene Expression and Gene Regulation (The Lac operon as a typical model of gene regulation).

Unit 2: Biotechnology and its application:

Chapter 3 – Biotechnology: Process and Application :

Genetic engineering (Recombinant DNA technology):

Transposons, Plasmids, Bacteriophages;

Producing Restriction Fragments, Preparing and cloning a DNA Library,

Gene Amplification (PCR). Application of Biotechnology in Agriculture – BT crops Biosafety Issues (Biopiracy and patents)

Unit 3: Biology and Human Welfare:

Chapter 4 – Enhancement in Food Production

Plant Breeding Tissue Culture: Concept of Cellular

Totipotency, Requirements of Tissue Culture (in brief),

Callus Culture, Suspension Culture.

Single Cell Protein. Biofortification.

Chapter 5 – Microbes in Human Welfare:

Microbes in Household food processing.

Microbes in Industrial Production.

Microbes in Sewage Treatment.

Microbes in Biogas (energy) Production.

Microbes as Biocontrol Agents Microbes as Biofertilizers.

Unit 4: Plant Physiology:

Chapter 6 – Photosynthesis

Autotrophic nutrition Site of Photosynthesis Photosynthetic Pigments and their role.

Light-Dependent Reactions (Cyclic and non-cyclic photophosphorylation)

Light-Independent Reactions (C3 and C4 Pathways) Chemiosmotic hypothesis, Photorespiration, Factors affecting Photosynthesis. Law of limiting factors.

Chapter 7 – Respiration

ATP as currency of Energy Mechanism of Aerobic (Glycol sis, TCA Cycle and Electron Transport System) and Anaerobic Respiration. Fermentation Exchange of gases. Amphibolic pathway. Respiratory quotient of Nutrients. Significance of Respiration.

Unit 5: Reproduction in Organisms:

Chapter 8 – Reproduction in Plants

Modes of Reproduction (Asexual and Sexual).

Asexual reproduction; uniparental modes vegetative propagation, micro propagation Sexual Reproduction: structure of flower Development of male gametophyte, Structure of anatropous ovule. Development of female Gametophyte. Pollination: Types and Agencies. Outbreeding devices; pollen-pistil interaction. Double Fertilization: Process and Significance. Post-fertilization changes (development of endosperm and embryo, development of seed and formation of fruit) Special modes-apomixis, parthenocarpy, polyembryony. Significance of seed and fruit formation.

Unit 6: Ecology and Environment

Chapter 9: Organisms and Environment -I : Habitat and Niche

Ecosystems: Patterns, components, productivity and decomposition, energy flow; pyramids of number, biomass, energy; nutrient cycling (carbon and phosphorous). Ecological succession, Ecological services carbon fixation, pollination, oxygen release. Environmental issues: agrochemicals and their effects, solid waste management, Green house effect and global warming, ozone depletion, deforestation, case studies (any two).

Section II – ZOOLOGY

Unit 1: Genetics and Evolution:

Chapter 10 – Origin and the Evolution of Life:

Origin of Life: Early Earth, Spontaneous, assembly of organic compounds, Evolution: Darwin's contribution, Modern Synthetic Theory of evolution, Biological Evidences, Mechanism of evolution; Gene flow and genetic drift; Hardy Weinberg principle; Adaptive radiation. Origin and Evolution of Human being.

Chapter 11 – Chromosomal Basis of Inheritance

The Chromosomal Theory. Chromosomes. Linkage and Crossing Over. Sex-linked Inheritance (Haemophilia and color blindness). Sex Determination in Human being, birds, honey bee. Mendelian disorders in humans-Thalassemia. Chromosomal disorders in human: Down's syndrome, Turner's syndrome and Klinfelter's syndrome.

Unit 2: Biotechnology and its application:

Chapter 12- Genetic Engineering and Genomics

DNA Finger Printing. Genomics and Human Genome Project. Biotechnological Applications in Health: Human insulin and vaccine production, Gene Therapy. Transgenic animals.

Unit 3: Biology and Human Welfare

Chapter 13- Human Health and Diseases

Concepts of Immunology: Immunity Types,

Vaccines,

Structure of Antibody, Antigen-Antibody Complex, Antigens on blood cells. Pathogens and Parasites (Amoebiasis, Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, Common cold and ring worm). Adolescence, drug and alcohol abuse. Cancer and AIDS.

Chapter 14- Animal Husbandry

Management of Farms and Farm Animals.

Dairy.

 Poultry.

 Animal Breeding.

Bee-Keeping.

Fisheries.

Sericulture

Lac culture

Unit 4: Human Physiology:

Chapter 15- Circulation

Blood composition and coagulation, Blood groups.

Structure and pumping action of Heart. Blood Vessels.

Pulmonary and Systemic Circulation.

  Heart beat and Pulse. Rhythmicity of Heart beat. Cardiac output, Regulation of cardiac activity.

Blood related disorders: Hypertension, coronary artery disease, angina pectoris, and heart failure. ECG, Lymphatic System (Brief idea): Composition of lymph and its functions.

Chapter 16- Excretion and osmoregulation

Modes of excretion-Ammonotelism, ureotelism, uricotelism. Excretory System. Composition and formation of urine. Role of Kidney in Osmoregulation.

Regulation of kidney function: reninangiotensin, atrial natriuretic factor, ADH and Diabetes inspidus, role of other organs in excretion.

Disorders; Kidney failure, Dialysis, Kidney stone (renal calculi). Transplantation. Uraemia, nephritis.

Chapter 17- Control and Co-ordination

Nervous System Structure and functions of brain and Spinal cord, brief idea about PNS and ANS. Transmission of nerve impulse. Reflex action. Sensory receptors (eye and ear), Sensory perception, general idea of other sense organs.

Endocrine System

Endocrine glands

Hormones and their functions

Mechanism of hormone action.

Hormones as messengers and regulators.

Hormonal imbalance and diseases:

Common disorders (Dwarfism, Acromegaly, cretinism, goiter, exopthalmic goiter, Diabetes mellitus, Addison's disease)

Unit 5: Reproduction in Organisms :

Chapter 18- Human Reproduction

Reproductive system in male and female.

Histology of testis and ovary.

Reproductive cycle.

Production of gametes, fertilization, implantation.

Embryo development up to three germinal layers.

Pregnancy, placenta, parturition and Lactation (Elementary idea).

Reproductive health-birth control,

Contraception and sexually transmitted diseases.

MTP, Amniocentesis; Infertility and assisted reproductive Technologies IVF, ZIFT, GIFT (elementary idea for general awareness).

Unit 6: Ecology and Environment:

Chapter 19-Organisms and Environment-II:

Population and ecological adaptations:

Population interactions-mutualism, competition, predation, parasitism, Population attributes- growth, birth rate and death rate, age distribution.

Biodiversity and its conservation Biodiversity- concept, patterns, importance, loss.

Threats to and need for biodiversity conservation, Hotspots, endangered Organisms, extinction, red data book, biosphere reserves, national parks and sanctuaries.

Environmental issues: air pollution and its control, water pollution and its control and radioactive waste management. (Case studies any two)

MATHEMATICS

PART–1

1. Mathematical Logic

Statements - Introduction, sentences and statement, truth value of statement, open sentences, compound statement, quantifier and quantified statements, logical connectives : conjunction, disjunction, negation, implication/ conditional, biconditional, truth tables of compound statements, examples related to real life and mathematics, statement patterns and 4. logical equivalence - tautology, contradiction, contingency, duality, negation of compound statement, contrapositive, converse, inverse, algebra of statements-idempotent law, associative law, commutative law, distributive law, identity law, complement law, involution law, DeMorgan's laws, difference between converse, contrapositive, contradiction, application-introduction to switching circuits (simple examples).

2. Matrices

trigonometric function, properties of inverse functions.
Pair of straight lines. Pair of lines passing through origin- combined equation, homogenous equation, theorem-the joint equation of a pair of lines passing through origin and its converse, acute angle between the lines represented by $ax^2+2hxy+by^2=0$, condition for parallel lines, condition for perpendicular lines, pair of lines not passing through origin-combined equation of any two lines, condition that the equation $ax^2+2hxy+by^2+2gx+2fy+c=0$ should represent a pair of lines (without proof), acute angle between the lines (without proof), condition of parallel and perpendicular lines, point of intersection of two lines.

3. Circle

Elementary transformation of a matrix-revision of cofactor and minor, elementary row transformation, elementary column transformation, inverse of a matrix-existence and uniqueness of inverse of a 5. inverse by elementary transformation, adjoint method, application-solution of system of linear equations by – reduction method, inversion method. tangents to a circle from a point outside

3. Trigonometric functions

Trigonometric equations-general solution of trigonometric equation of the type : $\sin\theta,=0, \cos\theta=0, \tan\theta=0$, $\sin\theta=\sin\alpha$, $\cos\theta = \cos\alpha$, $\tan\theta = \tan\alpha$, $\sin^2\theta = \sin^2\alpha$, $\cos^2\theta = \cos^2\alpha$, $\tan^2\theta = \tan^2\alpha$, $a\cos\theta + b\sin\theta = C$ solution of a triangle : polar coordinates, sine rule, cosine rule, projection rule, area of a triangle, application, Hero's formula, Napier Analogues, inverse trigonometric functions-definitions, domain, range, principle values, graphs of inverse ,trigonometric function, properties of inverse functions.

4. Pair of straight lines
Pair of lines passing through origin- combined equation, homogenous equation, theorem-the joint equation of a pair of lines passing through origin and its converse, acute angle between the lines represented by $ax^2+2hxy+by^2=0$, condition for parallel lines, condition for perpendicular lines, pair of lines not passing through origin-combined equation of any two lines, condition that the equation $ax^2+2hxy+by^2+2gx+2fy+c=0$ should represent a pair of lines (without proof), acute angle between the lines (without proof), condition of parallel and perpendicular lines, point of intersection of two lines.

5. Circle

Tangent of a circle-equation of a tangent at a point to 1) standard circle,2) general circle, condition of tangency only for line $y=mx+c$ to the circle $x^2 +y^2 =a^2$, tangents to a circle from a point outside the circle, director circle, length of tangent segments, normal to a circle-equation of normal at a point.

6.Conics

Tangents and normals-equations of tangent and normal at a point for parabola, ellipse, hyperbola; condition of tangency for parabola; ellipse, hyperbola; tangents in terms of slope for parabola, ellipse, hyperbola, tangents from a point outside conics, locus of points from which two tangents are mutually perpendicular, properties of tangents and normals to conics (without proof).

7. Vectors

Revision, Collinearity and coplanarity of vectors : linear combination of vectors, condition of collinearity of two vectors, conditions of coplanarity of three vectors, section formula : section formula for internal and external division, midpoint formula, centroid formula, scaler triple product : definition, formula, properties, geometrical interpretation of scalar triple product, application of vectors to geometry- medians of a triangle are concurrent, altitudes of a triangle are concurrent, angle bisectors of a triangle are concurrent, diagonals of a parallelogram bisect each other and converse, median of trapezium is parallel to the parallel sides and its length is half the sum of parallel sides, angle subtended on a semicircle is right angle.

8. Three dimensional geometry

Direction cosines and direction ratios: direction angles, direction cosines, direction ratios, relation between direction ratio and direction cosines, angle between two lines, condition of perpendicular lines.

9. Line

Equation of line passing through given point and parallel to given vector, equation of line passing through two given points, distance of a point from a line, distance between two skew lines, distance between two parallel lines (vector approach).

10. Plane

Equation of plane in normal form, equation of plane passing through the given point and perpendicular to given vector, equation of plane passing through the given point and parallel to two given vectors, equation of plane passing through three non- collinear points, equation of plane passing through the intersection of two given planes, angle between two planes, angle between line and plane, condition for the coplanarity of two lines, distance of a point from a plane (vector approach)

11. Linear programming problems

Introduction of L.P.P. definition of constraints, objective function, optimization, constraint equations, non- negativity restrictions, feasible and infeasible region, feasible solutions, Mathematical formulation-mathematical

formulation of L.P.P. different types of L.P.P. problems, graphical solutions for problem in two variables, optimum feasible solution.

PART – 2

1. Continuity

Continuity of a function at a point : left hand limit, right hand limit, definition of continuity of a function at a point, discontinuity of a function, types of discontinuity, algebra of continuous functions, continuity in interval-definition, continuity of some standard functions- polynomial, rational, trigonometric, exponential and logarithmic function.

2. Differentiation

Revision- revision of derivative, relationship between continuity and differentiability-left hand derivative and right hand derivative (need and concept), every differentiable function is continuous but converse is not true, Derivative of composite function-chain rule, derivative of inverse function, derivative of inverse trigonometric function : Derivative of implicit function definition and examples, derivative of parametric function – definition of parametric function , exponential and logarithmic function- derivative of functions which are expressed in one of the following form a) product of functions, b) quotient of functions, c) higher order derivative, second order derivative d) $[f]^{[g(x)]}(x)$

3. Applications of derivative
Geometrical application-tangent and normal at a point, Rolle's theorem, and Mean value theorem and their geometrical interpretation (without proof), derivative as a rate measure-introduction, increasing and decreasing function, approximation (without proof), Maxima and minima- introduction of extrema and extreme values, maxima and minima in a closed interval, first derivative test, second derivative test.

4. Integration
Indefinite integrals-methods of integration, substitution method, integrals of the various types, integration by parts (reduction formulae are not expected), integration by partial fraction-factors involving repeated and non-repeated linear factors, non-repeated quadratic factors, definite integral-definite integral as a limit of sum, fundamental theorem of integral calculus (without proof), evaluation of definite integral 1) by substitution, 2) integration by

parts, properties of definite integrals.

5. Applications of definite integral

Area under the curve : area bounded by curve and axis (simple problems), area bounded by two curves, volume of solid of revolution-volume of solid obtained by revolving the area under the curve about the axis (simple problems).

6. Differential equation

Definition-differential equation, order, degree, general solution, particular solution of differential equation, formation of differential equation-formation of differential equation by eliminating arbitary constants (at most two constants), solution of first order and first degree differential equation-variable separable method, homogeneous differential equation (equation reducible to homogeneous form are not expected), Linear differential equation, applications : population growth, bacterial colony growth, surface area, Newton's laws of cooling, radioactive decay.

7. Statistics

Bivariate frequency distribution - bivariate data, tabulation of bivariate data, scatter diagram, covariance of ungrouped data, covariance for bivariate frequency distribution, Karl Pearson's coefficient of correlation.

8. Probability distribution

Probability distribution of a random variable-definition of a random variable, discrete and continuous random variable, probability mass function (p.m.f.), probability distribution of a discrete random variable, cumulative probability distribution of a discrete random variable, expected value, variance and standard deviation of a discrete random variable, probability density function (p.d.f.), distribution function of a continuous random variable.

9. Bernoulli trials and Binomial distribution

Definition of Bernoulli trial, conditions for Binomial distribution, binomial distribution (p.m.f.), mean, variance and standard deviation, calculation of probabilities (without proof), Normal distribution : p.d.f., mean, variance and standard deviation, standard normal variable, simple problems (without proof).

ENGLISH

The topics Maharashtra State Board Syllabus cover under English are given below.

1. Prose
2. Poetry
3. Grammar
4. The Tenses
5. Types of Sentences
6. Clauses
7. Voice
8. Reported Speech
9. Uses of 'too' and 'enough'
10. Model Auxiliaries
11. Articles
12. Prepositions
13. Linking words/ Discourse makers
14. Word formation
15. Infinitives, Gerunds, and Participles

COMPUTER SCIENCE

PAPER-1

1. Operating systems
What is OS?
Services in OS.
Overview of OS - Windows 98, Windows NT, LINUX.
Concepts related to information management
-File system, Device drivers, Terminal I/O.
Concepts related to process management
-Process, Multiprogramming, Context switching, process states, priority, multitasking, time sharing.
Concepts related to memory management
-A typical map for single user computer, partitioning, fixed and variable
        partitioning, paging, segmentation, virtual memory.
GUI
Basic GUI, GUI features such as windows, task list, drag, resize, minimize, maximize, close.
Access and security aspect of OS
Security threats, attacks on security, computer worms, computer viruses.

2. Data Structure
Introduction to data structures.
Data structure operations.
Algorithmic notations.
Control structures.
Arrays - Representation in memory, travelling, inserting, deleting, sorting, binary search in an array, pointer arrays, records in memory using arrays.
Linked list, representation of linked list in memory.
Trees, binary trees, representing binary tree in memory.

3. C++
Review of C++.
Arrays, pointers, reference, strings.
Principle of object oriented programming.
Classes and object.
Constructors and destructors.
Operator overloading and type conversion.
Inheritance.

Virtual functions and polymorphism.
Working with files.

4. HTML
Introduction to HTML.
Why HTML? Its advantages and disadvantages.
Study of tags:
<html>, <head>, <title>, <body>, <p>, <hr>, <ul>, <li>, <pre>, <marquee>.
Font styles:
<b>, <i>, <u>, <big>, <small>, <sub>, <sup>, <font>.
Images:
href, hr, img, src, alt, height, width, align.
Tables:
<table>, <caption>, <tr>, <th>, <td>.
Use of scripting as a language support.
(**Note**: Only VB script using for ..NEXT, IF..THEN..ELSE, Msg box, Inbox,
      DIM, SET).

PAPER-2

5. Introduction to Microprocessors and organisation of 8085
Evolution of microprocessors.
What is microprocessors?
Block diagram of generic microprocessors and study of various blocks in it.
Block diagram of 8085 microprocessors.
Study of various blocks and functions of various pins on it.

6. Instruction set and programming of 8085
Addressing modes in 8085.
Programming model of 8085.
Study of instruction set.
Data transfer, arithmetic, logic, ranching, stack, I/O and machine control instructions.
Assemble language problems based on instructions.
(**Note**: The program size generally should not exceed 20-29 instructions.)

7. Introduction to Intel X-86 family

Introduction to advanced microprocessors.

Introduction to X-86 family and study of major attributes of the X-86 family processors.

Programming model of X-86 family of microprocessors.

8. Introduction to microcontroller

Introduction to microcontroller.

Study of 8051 architecture and programming model.

Over view of other micro controllers in the 8051 family.

Applications of microcontroller.

9. Networking technology

Study of transmission media.

Cable media, coaxial, twisted pair, fibre optic, their comparison, introduction to wireless media.

Network topologies- access methods,

Topologies - BUS, RING, STAR, Ethernet, TOKEN RING.

Protocols - Internet protocols.

Introduction to connectivity devices - Modem, HUB, Repeaters, Routers.

ELECTRONICS

Paper I: Applied Electronics

1. Electronic Instruments
 Detail study of CRT – How a CRO displays waveform – Block diagram of CRO – Front panel controls – Applications of CRO.
Function generator – Basic elements of function generator.
Digital Multimeter – block diagram.

2. DC power supplies
Half wave rectifier – Bridge Rectifier – Filter circuits – Load regulation, Line regulation – Zener as voltage regulator – Basic principle of voltage regulation using transistor circuit – Three terminal Regulators – SMPS.

3. Transducers
 Classification of transducers – Selection of transducers – Types of transducers – Thermistor – LDR – Capacitive transducer – LVDT – Piezo electric crystal –Loud Speaker – Gas sensor – Opto-coupler.

4. Operational Amplifiers
 Necessity of OPAMP – Block diagram of OP – AMP – OP – AMP parameters – Linear applications of OP –AMP – Inverting and Non-inverting Amplifier-Buffer ampllifier – Concept of virtual ground – Adder – Subtractor – Integrator and Differentiator Circuits.

5. Modern Electronic Communications
The elements of communication system – types of electronic communication – Survey of communication applications – Electron ic spectrum-Concept of bandwidth – AM principles – Modulation index and percentage of modulation – Sidebands and frequency domain – Frequency modulator
Types of communication – Satellite communication system – Application overview of satellite communication.
 Concept of digital communication.
Introduction to computer networks.
Use of fiber optics in communication.
Review of some modern communication applications – concepts of FACSIMILE – Cellular radio and RADAR.

6. Study of Integrated Circuits
 Block diagram, pin functions and applications of IC 555 and IC 741.

Paper 2: Digital Electronics

1. Number Systems
Decimal - Binary and Hexadecimal number system – BCD code – Binary to decimal and decimal to binary conversion – Hexa to binary and binary to Hexa conversion – Hexa to Decimal and Decimal to Hexa conversion – ASCII code - Binary Arithmetic.

2. Logic Gates
Study of NOT, OR, AND gates, symbols and truth tables - Boolean algebra - NAND, NOR as universal building blocks - De Morgan's theorems- EX-OR gates - Half Adder – Full adder.

3. Semiconductor Digital ICs
Introduction to logic families – Bipolar logic families and unipolar logic families, Characteristics of Digital ICs – TTL NAND gate CMOS, NAND, NOT, NOR gates.

4. Combinational Logic Circuits
Multiplexers and their use in combinational logic design – Combinational logic design using multiplexers – Demultiplexer and its use in combinational logic design– Encoder – Priority encoders Decoder and drivers for displays devices.

5. Electronic Counters:
S-R Flip Flop - Clocked S-R flip flop - D flip flop – T flip flop J–k flip flop– Edge triggered flip flops – Master slave concept – Ripple or Asynchronous counters Decade Counter Down counters – Ring Counter – Shift registers.

6. A/D and D/A Converters
Introduction -Digital to Analog converter - Weighted resistor ladder , R-2R ladder– Analog to digital converter – Counter type ADC-Successive approximation A/D converter.

7. Computer Fundamentals
Block diagram of computer – Concepts of bus – Study of Input Output devices Study of memory devices – Specifications of PCs.