PHYSICS

UNIT - I - Vector Fields

General expression for gradient, divergence curl and Laplace operators in orthogonal curvilinear Co-ordinates and their explicit form in Cartesion spherical-co-ordinates, Stokes theorem and Gauss theorem.

Matrix theory

Algebraic operation - Rank of a matrix. Eigen values and Eigen vectors characteristic equation - Cayely Hamilton theorem - Diagonalisation and Diagonalizability of unitary orthogonal. Hermitian and symmetric matrices.

Special functions

Legendre, Hermite and Lagune equation basic properties - Gamma and Beta functions.

UNIT-II - Probability and Theory of errors

Basic concept of probability distribution - Exclusive events and addition Compound events and products - Binomial - Poisson and Guassian distribution - Normal distribution of error - Standard error - Principle of least squares - Application of solution of linear equation - Curve fitting.

Group theory

Definition - Sub-groups - Homomorphism and isomorphism - Group representations - Irreducible representation - Unitary representation.

UNIT - III - Classical mechanics

Generalised co-ordinates - D'Alembert's principle, Lagrangian equation of motion - Hamiltonian equation - Conservative and non-conservative systems - Hamilton equation, cyclic variables, principle of least action - Theory of small oscillations - Normal co-ordinates and

normal modes - Linear Triatomi molecule - Rigid bodies -Moments and products of inertiaEuler's angle - Euler's equation of motionSymmetric top.

UNIT-IV - Statistical Mechanics

Maxwell Boltzmann statistics Maxwellian distribution of velocities - Mean - root mean square and most probable velocities Bose-Einstein statistics - Distribution function Phonon gas - Black body radiation - Fermy-Dirac statistics - Distribution function - Electron gas - Pauli paramagnetism - Thermionic emission - Elementary idea of phase transition Properties of liquid Helium - phase space, Liouville's theorem - statistical equation - micro canonical ensembles - Equation of statethermodynamic functions of an ideal gas equipartition of energy.

UNIT-V - Electromagnetic theory

Coulomb law - Gauss law - Poisson's equation - Laplace equation and solution to boundry value problem - Electrostatics of dielectric media - Molecular polarisability and its application - Vector - Scalar potential - B and H in a magnetic material - Maxwell's equations and their significance - Poynting theorem - Radiation of oscillating dipole.

Relativistic Mechanics

Basic ideas - Lorentz transformation. Time dilation and Lorentz contraction Velocity addition law - Momentum and energy in relativistic Mechanics - Centre of mass system for two relativistic particles.

UNIT-VI - Spectroscopy

Rotation spectra - Vibration spectra - Rotation vibration spectra of diatomic and linear molecules - Raman Spectra - experimental techniques and classical theory of Raman Scattering - Electronic state of diatomic molecules - Frank-Condon principle - Hund's coupling scheme - Evaluation of molecular constant from vibrational spectra data. Interaction between nuclear spin and magnetic field - Nuclear resonance-Chemical shift-Dipole-Dipole interactionSpin lattice interaction.

UNIT-VII - Solid State Physics

Energy levels and density of states in one, two and three dimensions - Electrical and Thermal conductivities - Wiedmann-Franz law. Energy bands in solids - Transport phenomena in semiconductors operational functions of a junction diode-Schottky diode - Bloch theorem - Krong-Penny mudel - Brillouin zones - Wave equation of an electron in a periodic potential.

Thermal Properties of solids

Laws of Thermodynamics - Maxwell's relations and their applications - Phase transitions - Production and measurement of low temperatures -Einstein and Debye theory of specific heats of solids.

Magnetic properties of materials

Langevin's theory of dia-para-magnetism - Quantum theory of para - magnetism Ferro - magnetism - Ferri - magnetism - superconductivity - Meissner effect Thermodynamics of superconducting materials - London equation - B.C.S. theory - Josephson's effect.

UNIT-VIII - Quantum mechanics

Schrodinger's wave equation - Free particle - Particle in a potential well and barrier penetration - The probability interpretation - Expectation value - Eigen functions and eigen values - Stationery states - Wave packet - Uncertainty principle - Linear Harmonic oscillator - angular momentum and addition of angular momenta. Peturbation theory Transition probability - Constant and harmonic perturbation - Scattering theory - Differential and total scattering cross section - Born approximation - Partial wave analysis and phase shift analysis - Relativistic wave equations - Klein - Gordon equations - Dirac equation and its free particle solution.

UNIT-IX - Nuclear Physics

Binding energy - Semi empirical mass formula - Stability of nuclei - Nuclear forces - Ground state of deuteron - Alpha decay - B decay - Fermi's theory - Selection rules Liquid drop model - Nuclear fission - Shell model - Collective models.

Nuclear Instrumentation

Cyclotron - Synchro cyclotron - Proton synchrotron - Detectors - G.M.Counter Scintillation Counter - Bubble chamber - Nuclear reactors - Neutron cross section - Fission product - Energy release - Chain reaction - Multiplication factor - Moderator - Natural Uranium - Diffusion equation.

Unit X - Electronics (Digital electronics)

Binary - Decimal - Octal and Hexadecimal numbers - 8421 Excess-3 - Gray Codes - Logic gates - Laws Boolean algebra - Half and full adders - Subtractors - RS, RST, JK and M/S Flip-flops - Ripple counter - Decade counter -Up-down counter - Serial and parallel registers.

Operational amplifier

Differential amplifier - Parameters - Applications - Analog integration and differentiation - Analog computation - Comparators - Sample and hold circuits - Oscillator Hartley-Colpitt- Phase Shift - Wien's bridge oscillators - Astable mono -Bistable multivibrators Clipping and clamping circuits.

Microwave Physics

Microwave generation - Klystron - Magnetron - Travelling wave tubes Microwave in rectangular and cylindrical wave guides - Characteristics of Antennas - Short dipole radiation - Antenna gain - Directivity - Radiation resistance - Radiation intensity.

Microprocessor

Evolution of Microprocessors - Organisation of micro-computers- Preliminary concepts - Basic concepts of programming - Architecture - Address - Data and control buses Memory decoding - Memory mapped I/O and I/O mapped I/O. Machine and instruction cycles Addressing modes - Use of arithmetic logical data - Transfer stack and I/O instructions Instruction set and assembly programming of 8085 microprocessor - Fetch - Execute - overlap Instruction cycles - Instruction forward - Memories - RAM-PROMS, EPROMSEEPROMS Static and Dynamic RAM.

Educational Psychology

Unit - 1

Pre-primary Education - Programme of Pre-primary Education - universalization of Primary Education - Equality of opportunity - Secondary and Higher Secondary Education - Need for uniform pattern - Non-formal and Adult Education - Functional Literacy Programme - Programmes for workers in industry - programme for dropouts - Role of Educational institutions in Non-formal Education - Open School / Open University, Quantity and Quality of Education - State and National leave - Unemployment and underemployment - Delinking employment from degrees - Skill development - Vocation Skill oriented education - Man power planning and education Brain drain - Special problems of rural and tribal people - illiteracy and poverty - Eradication of poverty through Education.

Unit - 2

National integration - International understanding - Value Education in action- Nation and health - sanitation - Safety and first aid - Women's education - Education for handicapped Education for gifted - Population Education - Need for protecting the environment - Environmental Education - Language policy - Medium of education - channel of international communication Management of Schools, private, aided, Government, Local authorities - Government Department of education, administration and academic supervision - Headmaster / Headmistress as an administrator and academic supervisor.

History and Culture of Tamil Nadu:

Unit - 3

Political - Spiritual - Religion - Literature - Language - Education - Natural Resources - Trade - Occupations - Historical places - Tourist centers - Arts - Games - Society.

Unit -4

   The Learner, Learning process - Learning situation - Significance of Education Psychology to the teacher concept of growth and maturity - development characteristics and trends - Development tasks and education - Development of mental abilities - Attention, inattention and distraction - span of attention, sensation and perception - factors in perception - Errors - concept formation - piglets states of cognitive development - concept maps language. Imagination, thinking and reasoning - Psycholinguistics - Implications for the teacher.

Unit -5

   Special characteristics of adolescents and their problems, attitudes, interest, group behavior, Discipline Leadership - Nature and importance of learning - individual differences in learning - Learning curves - Transfer of learning - Learning styles - Factors in learning - Types of learning - Trial and error - Conditioning - Classical and operant - Learning by insight - Imitation - Levels of learning - Remembering and forgetting - Learning Disabilities.

Unit - 6

   Motivation - Maslow's hierarchy of needs - roles of rewards and punishments - Levels of aspiration - Achievement motivation - Goal as a motivational factor - Nature of intelligence - Theories of intelligence - Assessment of intelligence - IQ constancy - Distribution - uses of intelligence test - Creativity - Creativity and intelligence - Identification and promotion of creativity - Meaning of personality - Factors influencing personality - Assessment of personality - integrated personality - concept of mental health hygiene - conflict and frustration - Unrest - Adjustment - Defence mechanisms - Mental illness - Guidance and counselling.

Unit -7

Meaning of educational innovation - principles involved in innovation - Emergence of school -In cultural, social and religious setting - Innovations that emerged from educational experiments-Tagore:- Santi Niketan- Gandhiji:- Basic Education - A.S.Neill;- Progressive School -Sri Aurobindo :- Ashram Schools. Rousseau: Children's Education - Montessori - Sense Experience - Bertrand Russel- Education for Social Order - Froebel- Kindergarten- Dewey- Pragmatic life J. Krishnamoorthy-Freedom in learning situation. Influence of Psychological factors on innovation - principles underlying self-learning devices. Piaget-Experiment's and discovery learning - Child- centered learning. Effects of cultural, religious and social factors on innovation- Principles of equality - conformity to common educational goals.

Unit -8

Modernization of education - National Educational Policy (1986) - DPEP Special focus on Teacher Education (DTERT, DIETs, BRCs, CRCs) MLL based curriculum and syllabus - Joyful learning - Autonomy in institutional structures - Individual freedom- Library based learning: Self-paced instruction -pace setting schools - Mobile schools- De- Schooling and non-classroom learning - community schools - school complex Distance education and open learning- Education through mass communication - special education -Sainik school - Defence academy - Educational Technology - need for and use of Instructional technology - mass media for instructional purposes - Review of radio and TV educational programmes - educational computing.

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Subject: General Knowledge

Unit-I   **Indian History**

History of India - Vedic period 1526 AD to 1947 - Free India - Modern India

Unit – II   **Indian Constitution**

Origin of Indian Constitution - Salient and special features - Fundamental rights - Legislature - Judiciary Executive - Audit franchise - Human rights.

Unit – III   **History of Tamil Nadu**

Ancient period - Sangam age - Chera, Chola, Pandya's - Economical, political, Social Conditions - Literature Architecture - Fine arts - Geography of Tamil Nadu - Natural boundaries - Resources - Rivers and places.

Unit-IV   **Personalities Books and authors - Discoveries**

Unit-V   **Sports & Games Confined to India**

Unit- VI   **Abbreviations**

Unit – VII   **Every Day Science**

Unit-VIII   **Current Affairs**

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