SYLLABUS STRUCTURE FOR RECRUITMENT OF LECTURERS IN

DIETs UNDER EDUCATION DEPARTMENT, GOVERNMENT OF SIKKIM, 2020

Papers	Compulsory /Optional	Subject	Marks
Paper 1	**Compulsory for all**	• English (General English) • Principles of Education and Educational Psychology.	50 marks 50 marks Total : 100
Paper 2 **Optional papers**	**1**	English • Pedagogy • Content	60 Marks 40 Marks Total : 100
	2	Nepali • Pedagogy • Content	60 Marks 40 Marks Total : 100
	3	Social Science • Pedagogy (Compulsory) • Content (Optional) Geography, Political Science, History, Economics, Sociology (Any one of the school Social Science Subject Subjects)	60 Marks 40 Marks Total : 100
	4	Science • Pedagogy (Compulsory) • Content (Optional) Biology, Chemistry, Physics (Any one of the school Science Subjects)	60 Marks 40 Marks Total : 100
	5	Mathematics • Pedagogy • Content	60 Marks 40 Marks Total : 100
	6	Foundation course (Education/Psychology)	100 Marks
	7	Physical Education • Pedagogy • Content	60 Marks 40 Marks Total : 100
Paper III. Practicals/Viva	Compulsory	A. Classroom Demonstration: B. Viva Voce/Personality	70 Marks 30 Marks
Total		Paper 1+2+3	300 Marks

Paper I (Compulsory for all)

Instructions :

1. This paper is divided into two sections- Section A and Section B. Each Section carries 50 marks.
2. Section A is General English and Section B is Principles of Education and Educational Psychology.
3. Both the sections are Compulsory.

SECTION A

General English **(50 Marks)**

1. Reading: 15 marks (2 Unseen Passages, Literary and Factual, Objective Type Questions- 8+7 marks).
2. Writing: 20 marks (Article/Essay Writing-12 marks, Letter Writing- 08 marks)
3. Grammar & Vocabulary: 15 marks (Objective Type Questions)

SECTION B

Principles of Education and Educational Psychology. **(50 marks)**

I. PRINCIPLES OF EDUCATION

UNIT I. UNDERSTANDING EDUCATION

- Concept, scope and functions of education
- Aims of education: Individualistic and socialistic aims of education.
- Freedom and Discipline: Concept and need for free discipline.
- Development of Human Values.
- The educational institutions – Formal, informal, non-formal.
- Agencies of education: a) Home b) School C) Peer group D) Religious organizations E) Mass- Media F) Community.
- Child - centrism in education: Its significance.

- Play and play- way method in education: Kindergarten, Montessori, Basic education and Project.
- Education for Nationalism and International Understanding.

UNIT II. ROLE OF PHILOSOPHY IN EDUCATION.

- Schools of philosophy and their influence on education: Idealism, Naturalism, Pragmatism and Realism
- Educational thinkers: **a)Aurobindo Ghosh** (aims of education) **b)J.Krishnamurthy** (education for individual and social transformation) **(c)Rabindranath Tagore** (educational philosophy) **d)Rousseau** (negative education& threefold meaning of nature in the Emile)

UNIT III. SOCIOLOGICAL BASES OF EDUCATION

- Relationship between Sociology and education & its educational implications
- Socialization: factors leading to socialization role of a teacher in the process of socialization.
- Education as an Instrument of Social Change.
- Four Pillars of learning: Delors Commission -1996.

UNIT IV. DEVELOPMENT OF EDUCATION AFTER 1947.

Constitutional provision for Education in India

- Brief outline of the recommendations made by different Education Commission:
    - University Education Commission (1948-49)
    - Secondary Education Commission (1952-53)
    - Indian Education Commission (1964-66)
    - NPE1968
    - Right of children to free and compulsory education Act 2009
- Monitoring agencies
    - UGC
    - NAAC
    - NCTE
    - NUEPA
    - NCERT
    - IASE

- CTE

UNIT V. EXAMINATION SYSTEM

- Issues related to examination system
- Measures for improvement of traditional type of examination
  Innovations in Examination system with special reference to CCE, NPE(1986), Kothari Commission (1964-66), NCF(2005) and RTE Act (2009)

II. EDUCATIONAL PSYCHOLOGY

- Meaning, nature, scope and aims of educational psychology.
- Relationship between Psychology and education.
- Application of educational psychology in the teaching learning process.
- Concept and principles of growth and Development
- Stages of development
- Erickson's Psychosocial development theory
- Kohlberg's moral development theory
- Learning: meaning, nature and scope
- Theories of learning: trial and error including laws of learning, conditioned response (Classical and Operant) and Gestalt theory.
- Laws of learning and factors affecting learning
- Transfer of learning
- Attention and Interest: Nature and conditions of attention, their educational implications.
- Maladjustment: meaning, causes of maladjustment in school, role of a teacher.
- Meaning, Nature and Scope of Educational Guidance; types of guidance, Educational Guidance Services in Schools: need, importance and activities.
- Meaning, Nature and Scope of Counselling: types of counselling; steps and techniques of counselling; qualities of a good counsellor. Relationship between Guidance and Counselling: activities for providing group guidance.

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ENGLISH

Total (60+40=100 Marks)

Time: 3 Hours

Note Briefly:

1. This paper is divided into two sections- Section A and Section B.
2. Section A is Methodology and carries 60 marks whereas Section B is Content and carries 40 marks.
3. Both the sections are compulsory.

Section A: Pedagogy of English Language ***(60 Marks)***

UNIT I:	Approaches & Methods of Teaching English, Resources in Teaching of English- (Learning Designs & Material Development)
UNIT II:	Skills in Language Learning & Teaching
UNITIII:	Teaching of Grammar, Vocabulary & Literature. Essentials of Learning English Communication at Elementary level
UNIT IV:	Assessment of Language/ Learner Assessment

Section B: Content ***(40 Marks)***

UNIT I

Nature of Language

- Features & Structure of Language

UNIT II

Language & Society

- Home language and School language
- Language and Dialect
- Power dynamics of language in society

UNIT III

Theories of Language Development

- Schema Theory of Language learning
- Early language development : Chomsky , Vygotsky ,Piaget
- Language Acquisition and Language Learning

UNIT IV

Language in School

- Language Across the Curriculum, Status of English Language in the Schools of Sikkim
- Multilingualism in the Classroom

UNIT V

National & State Language Policy

- NCF 2005 and NEP 2020 on Language Education
- Status of English Language in India

नेपाली पाठ्यक्रम

- नेपाली पाठ्यक्रमलाई अद्यापन कला (Pedagogy) र शिक्षण सामग्री (Content) गरि २ भागमा/खण्डमा विभाजन गरिएको छ।
- खण्ड 'क' कार्य प्रणाली (Methodology) हो अनि खण्ड 'ख' शिक्षण सामग्री हो
- खण्ड - क लाई 60 अंक र खण्ड - ख लाई 40 अंक गरी यस विषय नेपालीलाई जम्मा १०० अंक दिइएको छ।

खण्ड क – अध्यापन कला **(Pedagogy) – 60**

एकाइ - १
- भाषा शिक्षणको परिचय
- भाषा शिक्षणका पद्धतिहरु
- नेपाली भाषा शिक्षणका समस्याहरु

एकाइ -२
- भाषिक कौशल

एकाइ - ३
- व्याकरण शिक्षण
- शब्द भण्डार

एकाइ - ४
- शिक्षक सहायक सामग्री

एकाइ - ५
- भाषिक मुल्याङ्कन

खण्ड ख – शिक्षण सामग्री **(Content) - 40**

एकाइ - १
- भाषा
- भाषाको संरचना
- भाषाको प्रकृति
- नेपाली भाषा उत्पत्तिको संक्षिपत्त इतिहास

एकाइ -२
- विविध सन्धर्भमा नेपाली भाषा शिक्षण
- पहिलो भाषा सिकाइ
- दोस्रो भाषा सिकाइ
- पहिलो र दोस्रो भाषा सिकाइमा भिन्नता

एकाइ - ३

- नेपाली भाषा शिक्षणका आवश्यत्ता
- नेपाली भाषा शिक्षणको समस्याहरु

एकाइ - ४

- मातृभाषा शिक्षण
- मातृभाषा शिक्षणको महत्व
- सिक्किमका अन्य मातृभाषा (नेपाली बाहेक) का स्थिति
- प्राथमिक स्तरसम्म मातृभाषामा शिक्षणको आवश्यक्ता

एकाइ - ५

- राष्ट्रिय शिक्षा नीति २०२०
- सिक्किममा नेपाली भाषा शिक्षण
- बहुभाषिकता
- त्रि – भाषा सूत्र
- राष्ट्रिय स्तरमा नेपाली भाषा

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SOCIAL SCIENCE

Total (60+40=100 Marks)

Time: 3 Hours

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1. This paper is divided into two sections- Section A and Section B.
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SECTION A (60 Marks)

Unit I: Concept of Social Science

- Meaning, Scope and Nature of Social Science.
- Inter relationship of various branches of Social Science.
- Similarities and differences between Social Studies and Social Sciences.

Unit II: Purposes of Social Science Teaching

- Objectives of Teaching Social Science.
- General and Instructional Objectives of Teaching Social Science and its Aims and Values.

Unit III: Principles of Designing Social Science Curriculum

- Meaning and Importance of the Curriculum, Objectives of Social Science Curriculum, Contents of Social Science Curriculum and Syllabus.

Unit IV: Teaching-Learning Resources in Social Sciences

- People as resource: The significance of oral data.
- Types of Primary and Secondary Sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Various teaching aids: Using atlas as a resource for Social Sciences; maps, globe, charts, models, graphs, visuals, Audio-visual aids, CD-ROM, multimedia, internet.

Unit V: Strategies of Teaching Social Science

- Need of a variety of Methods in Social Science
- Characteristics of a Good Teaching Method

- Need of Different Methods of Teaching Social Science- Lecture Method, Discussion Method, Lecture-Cum-Discussion, Field Visit, Observation Method, Project Method, Concept Mapping, Problem-solving Method, Dramatization, Source Method.

Unit VI: Planning of Instruction in Social Science

- Importance of Lesson Planning, Steps in Lesson Plan, Unit Plan.
- Micro Teaching Lesson Plans for Developing Skills

Unit VII: Assessment and Evaluation in Social Sciences

- Meaning and Purpose: Assessment and Evaluation in Social Sciences
- Forms and Assessment Strategies in Social Sciences
- Remedial Teaching- Meaning and Definition of Remedial Teaching, Objectives of Remedial Teaching, Functions of Remedial Teaching,

SECTION B (40 Marks)

POLITICAL SCIENCE

Introduction to Political Theory and Thought

- **Western Political Thought**: Greek thought: Plato, Aristotle. Roman thought: Cicero. Medieval thought: Church and the State. Renaissance and Machiavelli
- Theories of Origin and Functions of the State

Indian Political Thought

- Ancient Indian Political Thought: Main Features– Contribution of Kautilya.
- Medieval Political Thought: Main Features.
- Indian Awakening and birth of Modernity: Raja Ram Mohan Roy and Sir Syed Ahmed Khan
- Gandhi's Political Thought on State, Citizenship, Democracy, Nationalism, Colonialism, Imperialism, Structural Violence, Satyagraha as a means of conflict resolution, Pacifism.

Feminism: Theory and Practice

- Feminist theorising of the sex/gender distinction
- Liberal, Socialist, Marxist, Radical feminism, New Feminist Schools/Traditions
- Feminist issues and women's participation in anti-colonial and national liberation movements with special focus on India.

Indian Government and Politics

- Historical Background of Indian Constitution: 1919 and 1935 Acts.

- The Preamble; Fundamental Rights and Duties; Directive Principles; Nature of Federalism, Union-State relations.
- Executive: Union and the States. (a) President, Prime Minister, and the Council of Ministers. (b) Governor, Chief Minister and the Council of Ministers. (c) Emergency Provisions.
- Legislature: Union and the States (a) Council of States and the House of the People - Law-making procedure and Amendment– Speaker (b) State Legislature– composition and functions.
- Judiciary: Supreme Court and the High Courts– composition and jurisdiction

International Relations

- Issues in International Relations: Cold War and Military Alliances, post-cold war world order. Non-Alignment in the Post-Cold War Period; North South Conflict and Dialogue, Global Terrorism, Human Rights and Humanitarian Intervention, Globalisation Problem of Conflict and Peace (Case of Afghanistan)
- India's Relations with her Neighbours: China, Pakistan, Nepal, Bhutan, Bangladesh, Sri Lanka.

International Organizations

- UNO and Its Organs: General Assembly, Secretariat, International Court of Justice, ECOSOC, Trusteeship Council, Security Council of UNO: Composition and Functions
- Role of Security Council in maintaining World Peace
- India's Contribution in maintaining World Peace
- Specialised Agencies of the UN:UNESCO, United Nations Development Programme (UNDP),WHO
- SAARC: Composition and Functions

HISTORY
(40 Marks)

Ancient India

1. Harappan Culture

a. Early urban centres as economic and social institutions

b. How new data can lead to revision of existing notion of history

2. Political and Economic History - Inscriptions

a. From Mauryan to the Gupta Period

b. Ashokan inscriptions

3. History of Buddhism (Sanchi Stupa),Vedic Religion and Jainism-

Major religious development in early India

Medieval India

4. Medieval Society through travelers account

a. Alberuni, Ibanbatuta, Bernier-Where they travelled, why they travelled, what they wrote and for whom they wrote

b. Importance of travelers account as source of social history

5. Religious histories

a. The Bhakti - Sufi Traditions

b. Ideas and practices of Bhakti - Sufi saints

6. New Architecture: Hampi

a. New buildings during Vijayanagar period: Temples, forts, irrigation facilities

b. Relationship between architecture and political system

c. Story of discovery of Hampi

7. Agrarian Relation: Ain-i-Akbari

a. Structure of agrarian relations in the 16th and 17th centuries

b. Ways in which historians have used Ain-i-Akbari text to reconstruct history

8. The Mughal court: Reconstructing history through chronicles

a. Political history 15th - 17th centuries

b. Mughal court and politics

Modern India

9. Colonialism and Rural Society

a. Life of zamindars, peasants and artisans in the 18th century

b. Revenue settlement of East India Company

c. Effects of colonialism on zamindars, peasants and artisans

10. Representaions of 1857

a. The events of 1857-1858: how they are being reinterpreted

b. How these events were recorded and narrated

11. Mahatma Gandhi

a. Nationalist movement 1918-1948: Satyagraha, Non-Cooperation Movements, etc

b. Nature of Gandhian politics and leadership

12. Partition through oral sources

a. History of the 1940's

b. Nationalism, Communalism and partition: Focus on Punjab and Bengal

13. The Making of the Constitution

a. Independence and new nation states: History of the early years after independence

b. Making of the Constitution: The constitutional assembly debates

GEOGRAPHY

(40 Marks)

Physical Geography

- Earth's Interior & Movements of the Earth
- Landforms and their significance, formation and evolution of landforms
- Weathering and Erosion- Meaning, Agents like River, Wind, Glacier, wave, resultant physical features
- Rocks and Minerals their classification.

Climatology

- Atmospheric composition and structure
- Insolation and temperature: factors and distribution, Heat budget, temperature inversion
- Atmospheric pressure and winds: planetary winds, forces affecting winds, jet streams

- Monsoon: origin and mechanism.

Human Geography

- Fundamental concept in Human Geography (Place, Space and Landscape).
- Understanding of man nature relationship: Determinism, Possibilism and Neo determinism
- Population growth and distribution with special reference to India; population composition; Demographic Transition Theory
- Migration: Causes, types and consequences

Economic Geography

- Meaning, concept and classification of Resources
- Concept and classification of Economic Activities – Primary, Secondary and Tertiary
- Conservation and management of Resource for sustainable Development

Geography of India

- Physiographic Division of India
- Soil- types and distribution
- Natural vegetation and wild life (fauna & flora)
- Natural resources
- Agriculture and Irrigation

Maps and Scales

- Map Projection; Thematic Maps and Diagrams
- Cartographical techniques; interpretation of topographic map
- Aerial photography; Remote sensing; field survey
- Statistical Techniques; Mean, Media, Mode to study geographical phenomenon, Measurement of Central Tendency.

Economics

(40 Marks)

I. Micro Economics

Introduction

- Problem of scarcity and choice
- Concept of Production Possibility Curve
- Concept of Opportunity cost

Theory of Consumer Behaviour

- Budget set and Budget line
- Cardinal Utility Theory: concept of utility, total utility and marginal utility
- Consumer's equilibrium under utility analysis
- Ordinal Utility theory: Indifference curve approach, Consumer's Preferences
- Consumer's equilibrium income and substitution effects
- Law of Equi-marginal utility
- Consumer's surplus
- Paradox of Value
- Income consumption path
- Price consumption curve and the derivation of demand curve for a commodity.
- Demand: Law of demand, determinants of demand, movement vs. shifts in demand curve, Elasticity of demand: types of elasticity, method of calculation: Price, Arc and Point elasticity
- Engel's Law

Theory of Producer Behaviour

- Production: concept of production function, production with two variables input
- Law of variable proportion
- Isoquant and Economic region of production
- Return to scale, Economies and Diseconomies of scale
- Cost: Concept of cost function, costs in the short run and long run
- Profit maximization and cost minimization
- Supply: Law of supply, determinants of supply, movement vs. shifts in supply, Elasticity of supply: types, method of calculation
- Market equilibrium and price determination

Market Structure

- Perfect competition: assumptions, theory of firm under perfect competition
- Revenue: average and marginal revenue, equilibrium of firm in the short run and long run
- Monopolistic competition: equilibrium in the short run and long run
- Oligopoly: characteristics , oligopoly models- Cournot, Sweezy, Stackleberg and collusive oligopoly
- Monopoly: concept of supply curve under monopoly, price discrimination

II. Macro Economics

National Income Accounting

- Circular flow of income: meaning, models: two, three and four sector
- National income: concepts and related aggregates, methods of calculating national income: product, income and expenditure
- Limitations of the GDP concept
- Green GNP

Keynesian Theory of Income Determination

- Concept of AD and AS, Concept of effective demand
- Linear consumption function
- Consumption function: average and marginal propensity to consume
- Concept of saving and investment function: average and marginal propensity to save
- Concept of Investment Multiplier
- Fiscal Policy and its impact
- Inflation: definition, types, causes and effects of inflation on different sectors of Economy

Money in the Modern Economy

- Money: concept, Quantity theory of Money- Cash transactions and Cash balance approach
- Money supply in India
- Credit creation by the commercial bank
- Central bank: functions, credit control methods of central bank

Balance of Trade, Balance of Payment and Exchange Rate

- Absolute and Comparative advantage
- Concept of Balance of Trade
- Balance of payment- current and capital account
- Determination of exchange rates

III. (Statistics for Economics)

- Mean, Median and Mode
- Range, Mean Deviation, Quartile Deviation and Standard Deviation
- Simple Correlation Coefficient: Properties and Calculation
- Probability Theory: Concepts of sample space and events, Meaning of Probability and the Axiomatic Approach

IV. Indian Economic Development

Characteristics and causes of Under-developed countries with special reference to India

- Role of Technology, Sustainability and institutional factors
- Rural and Urban Unemployment in India
- Employment generation schemes and their impact

Sectoral Aspects of the Indian Economy

- Agriculture: Its importance, Problems and Solutions regarding low productivity and Agricultural Credit
- Industry: Industrial Policy pre and post 1991. Public vs. Private sector, Foreign Direct Investment
- Impact of Economic Reforms
- Environment and Sustainable Development

Sociology Syllabus

(40 Marks)

I. Sociology – The Discipline

- Nature and Scope of Sociology
- Sociology and the other Social Sciences

II. Basic Concepts

- Society, Community, Association,
- Culture &Socialization
- Social Structure
- Status & Role
- Social Groups
- Norms, Values &Sanctions

III. Social Institution

- Family, Marriage and Kinship
- Political Institution
- Religion as a Social Institution
- Education as a Social Institution

IV. Social Stratification

- Marxian Approach
- Weberian Perspective: Class & Status Group

V. Tribes in India

- General Characteristics
- Social Institutions: Economy, Religion, Marriage
- Integration & Marginalization

VI. Sociology of Media

- Types of Mass Media
- Changing nature of Mass Media

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SCIENCE

Total (60+40=100 Marks)

Time: 3 Hours

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SECTION A (Compulsory)

(METHODOLOGY OF TEACHING SCIENCE)

(60 MARKS)

Unit I: Nature of Science and Science education

- Understanding Science – Nature of Science
- What is Science- Science as a body of knowledge, Science as a process of inquiry, Science as a way of thinking,
- Value development through Science
- A historical perspective: the development of science as a discipline
- Development of Scientific Temper, Scientific attitude, Ethics of science
- Science Education in the context of India.

Unit II: The learner context

- Children's conceptualization of scientific phenomena- Pre-conceptions in science and their significance in knowledge constructions
- Misconceptions and 'alternative frameworks' in science.
- Process skills in Science
- Knowledge construction in science: conceptual schemes, concept maps.

Unit III: Teaching and Learning of Science

- Aims and objectives of Teaching Science at the elementary and Secondary level , Learning Outcome Vs. Learning Objective.
- Approaches to curriculum transaction: integrated approach and disciplinary approach; Interdisciplinary.
- Guiding principles for selecting teaching methods, lecture method, demonstration method, lecture cum demonstration method, laboratory method, project method, problem solving method, heuristic method, programmed instruction method, individualized instruction method
- Teaching readiness: Planning of teaching Science, year plan, unit plan and period plan.
- Identifying, creating and using different type of learning resources.
- Assessing teaching learning resources such as books, films, multimedia packages for their relevance and age appropriateness.

Unit –IV: Assessment and Evaluation in Science

- Meaning, need and importance
- Connecting teaching learning and assessment
- Criteria of test: tools and techniques of evaluation, steps in test construction.
- Assessment of process skills
- Continuous and comprehensive Assessment: Formative and Summative assessment (assessment for learning, assessment of learning and assessment as learning), Rubrics, weightage tables and reporting procedure.
- Diagnostic Test and Remedial Teaching in Science, Action Research in Science

SECTION B (Content)
(40 marks)

BIOLOGY

Unit I: Cell Structure and Function

- Cell –the unit of life- structure of Prokaryotic cells and Eukaryotic cells, plant cell and animal cell.
- Cell cycle and cell division – phases of cell cycle, significance of mitosis and meiosis.

Unit II: Biological classification, Structural Organization in Plants and Animals.

- Biological classification- five kingdom classification, classification up to family level.
- Anatomy of flowering plants – The tissue (Meristematic and Permanent tissue), The tissue system (Epidermal tissue system, Ground tissue system, vascular tissue system), Anatomy of Dicotyledonous and monocotyledonous plants, Secondary growth (vascular cambium and cork cambium).
- Structural organization in animals–Animal tissues (Epithelial tissues, connective tissues, muscle tissues, neural tissues), organ and organ system of earthworm, frog, and cockroach.

Unit III: Human Physiology

- Digestion and absorption – human digestive system, digestive glands, absorption of digested food, disorder of digestive system
- Breathing and exchange of gases – human respiratory system, mechanism of breathing, respiratory volumes and capacities, disorders of respiratory system.
- Excretory products and their elimination
- Locomotion and movement – human excretory system, disorders of excretory system.
- Neural control and co-ordination – neuron as structural and functional unit of neural system.
- Chemical coordination and integration: endocrine glands and hormones, human endocrine system, role of hormones as messenger and regulators.

Unit IV: Plant Morphology and Physiology

- Morphology of flowering plants – modification of root, modification of shoot, modification of leaves, parts of flower, the fruit, structure of dicotyledons seed and monocotyledon seed, Description of a typical flowering plant. (e.g. Solanaceae, Liliaceae)

- Transport and Mineral nutrition in plants – means of transport -diffusion, facilitated diffusion, active transport, osmosis, plasmolysis, imbibition, transpiration, uptake and transport of mineral nutrients.
- Mineral nutrition – role of macro and micro nutrients, metabolism of nitrogen cycle,
- Plant hormones-types and functions
- Photosynthesis in higher plants – where does photosynthesis take place, light reaction, C3 and C4 pathway, photorespiration, factors affecting photosynthesis.
- Respiration in plants: exchange of gases, cellular respiration, glycolysis, fermentation (anaerobic), TCA cycle, CAM and electron transport system (aerobic).

Unit V: Ecology and adaptation

- Ecosystem – structure and function, major ecosystems, energy flow, Nutrient cycling (carbon cycle, Nitrogen cycle, phosphorous cycle), ecological succession.
- Biodiversity and conservation – patterns of biodiversity, Mega-biodiversity, biodiversity hotspot, loss of biodiversity, in-situ and ex-situ conservation.
- Environmental issues-air pollution, water pollution and its control, agrochemicals and their effects, radioactive waste management, ozone layer depletion.

Unit VI: Genetics, Adaptation and Evolution

- Principles of inheritance and variation–Mendel's law of inheritance, law of dominance, law of segregation and law of independent assortment, test cross, back cross, chromosomal theory of inheritance, sex determination, genetic disorders, chromosomal disorders.
- Molecular basis of inheritance – the structure of DNA, properties of genetic material (DNA versus RNA), evidences of DNA as genetic materials, central dogma of molecular biology (replication, transcription and translation), DNA fingerprinting, operon.
- Adaptation-Plants and Animals, Adaptive Radiation, Divergent and Convergent Evolution, Lamarckian principle, Darwinian principle, mutation theory and Neo-Darwinian principle of Evolution.

Unit VII: Microbes, microbes in Human welfare and Biotechnology

- Pathogens, parasites causing human diseases (dengue, malaria, pneumonia, common cold, filariasis, typhoid) and their control.
- Microbes in human welfare: microbes in food processing, Industrial production and sewage treatment, microbes as bio control agents and bio fertilizers.
- Biotechnology-principles and processes, biotechnological applications in agriculture and medicine, transgenic animals and ethical issues.

120

CHEMISTRY

(40 marks)

Unit I : Atomic Structure, Periodic Classification and Chemical Bonding.

- Structure of atom
- Classification of elements
- Chemical bonding and molecular structure.

Unit II: Chemical Reaction

- Types of chemical reaction and representation of chemical reaction.
- Mole concept
- Energy changes during the chemical reaction.
- Chemical equilibrium.

Unit III: States of matter

- Three states of matter, intermolecular inheritance, types of bonding, melting and boiling points, role of gas law in elucidating the concept of the molecule, Charle's law, Gay Lussa's law, Avogadro's law, ideal behavior, empirical derivation of gas equation, Avogadro's number, ideal gas equation, kinetic energy and liquefaction of gases, critical temperature.
- Liquid state – vapour pressure, viscosity and surface tension.

Unit IV: Thermodynamics

- Concept of system, types of system, work, heat, energy, extensive and intensive properties, state function
- First law of thermodynamics – internal energy and enthalpy, heat capacity and specific heat. Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution.
- Introduction of entropy as a state function, second law of thermodynamics, Gibbs energy change for spontaneous and non-spontaneous process, criteria for equilibrium
- Third law of thermodynamics.

Unit V: Electrochemistry

- Redox reaction, conductance in electrolytic solution, specific and molar conductivity variation of conductivity with concentration.

- Kohlrausch's law, electrolysis and law of electrolysis, dry cell – electrolytic cells and galvanic cells, lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cell.
- Relation between Gibbs energy change and EMF of a cell, fuel cells, corrosion.

Unit VI: Haloalkanes and Haloarenes.

- Haloalkanes: Nomenclature, nature of C–X bond, physical and chemical properties, optical rotation mechanism of substitution reactions.
- Haloarenes: Nature of C–X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only).
- Uses and environmental effects of - dichloromethane, trichloro methane, tetrachloromethane, iodoform, freons, DDT.

Unit VII: 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 with special reference to methanol and ethanol.
- Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.
- Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

UnitVIII: 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 IX: Amines

- Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.
- Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

PHYSICS
(40 Marks)

Unit I: Kinematics

- Motion in a Straight Line Frame of reference, Motion in a straight line: Position-time graph, speed and velocity.
- Elementary concepts of differentiation and integration for describing motion, uniform and non- uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity - time and position-time graphs.

Unit II: Laws of motion

- Laws of Motion Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion.

Unit III: Thermodynamics

- Thermal equilibrium and definition of temperature (zeroth law of thermodynamics), heat, work and internal energy.
- First law of thermodynamics, isothermal and adiabatic processes. Second law of thermodynamics: reversible and irreversible processes.

Unit IV: Electrostatics

- Electric Charges and Fields Electric Charges; Conservation of charge, Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.
- Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole. Electric flux, statement of Gauss's theorem

Unit V: Current Electricity

- Current Electricity Electric current, flow of electric charges in a metallic conductor Ohm's law, electrical resistance, V-I characteristics (linear and non-linear),
- Electrical resistivity and conductivity series and parallel combinations of resistors; temperature dependence of resistance
- Electrical energy and power.

Unit VI: Electromagnetism

- Magnetic effects of current, Need for displacement current
- Electromagnetic wave and their characteristics, transverse nature of, electromagnetic waves. Electromagnetic spectrum (radio waves, microwaves, infra red, ultra violet , x rays, gamma rays) including elementary facts about their uses.
- Electromagnetic induction.

Unit VII: Optics

- Ray Optics and Optical Instruments Ray Optics: Reflection of light, spherical mirrors, mirror formula, refraction of light, total internal reflection and its applications, optical fibres
- Refraction at spherical surfaces, lenses, refraction of light through a prism. Scattering of light - blue colour of sky and reddish appearance of the sun at sunrise and sunset.
- Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting)

Unit VIII: Atoms and nuclei

- Atoms Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model,
- Nuclei Composition and size of nucleus, Radioactivity, alpha, beta and gamma particles/rays and their properties; nuclear fission, nuclear fusion.

MATHEMATICS

Total (50+50=100 Marks)

Time: 3 Hours

Note Briefly:

1. This paper is divided into two sections- Section A and Section B.
2. Section A is Methodology and carries 60 marks whereas Section B is Content and carries 40 marks.
3. Both the sections are compulsory.

SECTION A: Methodology (60 Marks)

Nature of Mathematics:
Human need as a basis of growth in Mathematical Thinking, Pure and Applied Mathematics, Intuition & logic in Mathematical thinking, Axiomatic nature of Mathematics, Language of Mathematics

Need and importance of teaching Mathematics in school curriculum:
Social aspect, Mathematical aspect, Applications of Mathematics

Trends and Principles of formulating Mathematics Curriculum:
Factors affecting change in Curriculum, Principles of formulating Mathematics Curriculum.

Contribution of Indian Mathematicians:
Basic principles of Methods of teaching of Mathematics: Principles of child development and learning, Trends in organizing content, Problem solving approach to teaching.

Methods of teaching Mathematics:
Induction and deduction, Analytic and synthetic methods, Heuristic/ Discovery method

Techniques in Teaching Mathematics:
Drill and practice, Oral and written work, Play way Technique, Assignment and Home work, Teaching – Learning materials and teaching aids, Laboratory approach to teaching Mathematics

Planning for effective instruction of Mathematics

Evaluation in Mathematics

Teaching of Arithmetic & Commercial Mathematics, Algebra and Geometry.

SECTION B : Content M.Marks : 40

Unit – 1

1. **Foundations :** Sets, subsets, operations on sets, union, intersection and complement, De-Morgan's law, Cartesian product of two sets, binary operations in a set. Similar sets, finite and infinite sets, countable and uncountable sets.
2. **Complex numbers**: Argand plane and polar representation of complex numbers. De Moivre's theorem and its applications, exponential Sine, Cosine and logarithm of a

complex number. Inverse circular and hyperbolic functions, Polynomials, Fundamental theorem of classical algebra, , polynomials with exactly n roots, nature of roots of an equation, statements of Descartes' rule of signs and its applications, Roll's theorem and its direct applications, relation between roots and co-efficient, symmetric functions of roots, transformation of equations, Cardan's method of solution of a cubic

Unit – 2 Calculus

1. **Differential Calculus:** Limit, Continuity, differentiability, successive differentiation, nth derivative, Leibnitz theorem and its application. Partial differentiation, first and higher order derivatives, differentiation of homogeneous functions, Euler's theorem, total derivative and differential, differentiation of implicit functions and composite functions. Rolle's Theorem, Mean Value Theorem, Taylor's theorem, Maclaurin's theorem for one variable, indeterminate form, L Hospital's theorem, derivatives of higher order, Taylor's theorem.
2. **Integral Calculus**: Integration as anti-derivative. Substitution method, Partial fraction, Integration by parts. Definite integral as a limit of sum. Fundamental theorem of Calculus. Length of arcs, surface areas and volumes of solids of revolutions for standard curves, in Cartesian and polar co-ordinates, Improper Integrals, beta and gamma functions.
3. **Ordinary differential equations:** definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation. Solution of ordinary differential equation of first order and first degree, variable separable and reducible to homogeneous forms, reducible to homogeneous forms, linear equations and Bernoulli equations, exact equations, equations reducible to exact form with standard integrating factors, equations of first order and first degree, Claret's equation, singular solution for Claret's equation, orthogonal trajectories in Cartesian and polar forms. Second and higher order ordinary linear differential equations with constant co-efficients.
4. **Laplace transform** of standard functions, periodic functions. Existence theorem for Laplace transforms, shifting theorems, inverse Laplace transforms differentiation and integration of transforms, Convolution theorem.
5. **Partial differential equation**: definitions, first order partial differential equations, Lagrange's solution , some special type of equations that can be solved by methods other than general method, Charpit's general method of solution. Partial differential equation of 2^{nd} and higher orders.classification of linear partial differential equation of 2^{nd} order, homogeneous and non-homogeneous equations with constant co-efficients, partial differential equations reducible to equations with constant co-efficients. Monge's method and application in heat and wave equations.

Unit – 3 Vectors and Three Dimensional Geometry

1. **Straight line**: equation (symmetric and parametric form), direction ratios and direction cosines, canonical equation of the line of intersection of two intersecting planes, angle between two lines, distance of a point from a line, condition of co-planarity of two lines, equations of skew lines, shortest distance between two skew lines.
2. **Plane:** general form, intercept form and normal form, equation of plane passing through the intersection of two planes, angle between two intersecting planes, bisectors of angles between two intersecting planes, parallelism and perpendicularity of two planes.
3. Sphere, cone and cylinder: general equation and problems.
4. **Vector calculus:** vector differentiation, gradient, divergence, curl and Laplacian operators, vector identities, line integral and basic properties, examples on evaluation of the integrals, definition of a double integral, its conversion to iterated integrals, evaluation of a double integral by change of order of integration and by change of variables, surface areas as double integrals, definition of a triple integral and evaluation , change of variables, volume as a triple integral, line, surface and volume integrals of vector functions. Greens theorem in the plane, Stokes's theorem, Gauss Divergence theorem.

Unit – 4

1. **Groups**: definitions, examples, properties, subgroups, cyclic groups, co-sets, Lagrange's theorem, normal subgroup, quotient group, homomorphism of groups, fundamental theorem of homomorphism, isomorphism.
2. **Rings:** definitions, examples, properties. Subrings, ideals, principal, prime and maximal ideal in a ring. Homomorphism and Isomorphism of rings, integral domains, fields, properties following the definitions
3. **Vector Space:** definitions, examples, properties, subspaces, span of a set, linear dependence and independence, dimension and basis.
4. **Matrix and Determinants**: Fundamentals of matrix algebra, symmetric and skew-symmetric, Hermitian and Skew-Symmetric matrix, idempotent, nilpotent, orthogonal, unitary matrices and their properties. Rank of a matrix, normal forms. Finding inverse of a matrix by elementary transformation, system of linear equations and consistency, characteristic equations, Eigen values, Eigen vectors and properties, Cayley Hamilton theorem. Determinants, properties, minors, cofactors. Cramer's rule.
5. **Linear Transformation**: definitions and examples, Range and Kernel of a linear map, matrix of the linear transformation, rank and nullity, inverse of a linear transformation.
6. **Inner Product spaces**: Cauchy- Schwarz inequality, orthogonality, orthonormality, Gram-Schmidt orthogonalization process.
7. **Metric spaces**: Euclidean space, open balls and open sets, closed sets, adherent points, and accumulation points. The Bolzano- Weirstrass theorem, Heine–Boral theorem, Compactness. Convergent sequences in a metric space, subsequences, tests of convergence, Cauchy sequence, upper and lower limits, complete Metric space, limit of function. Series, definitions, tests of convergence, uniform convergence.

8. **Linear Programming Problem**: definitions, formulation, graphical solution, Simplex method. Dual and primal. Transportation problem, initial basic feasible solution, balanced and unbalanced transportation problem, assignment problems.Network definitions, shortest route problem, minimal spanning tree problem. Project scheduling by PERT-CPM.
9. **Graph theory**: definition of graph and examples, subgraphs, incidence and adjacency matrices, isomorphism, complement of a graph. Walks, trails and paths, connectedness and components, cut points and bridges. Eulerian graphs, Konigsberg bridge problem, Ramsay's puzzle, five color theorem.
10. **Numerical Analysis**: Solutions of equations: Bisection method, Regula falsi method, Newton Raphson method, roots of polynomial.
11. **Interpolation:** Newton's forward and backward interpolation, Lagrange's interpolation, divided difference.
12. **Numerical Differentiation:** Numerical quadrature formula, Newton –Cote's formula, Gauss –quadrature formula, Chebychev's formula.
13. **Linear equation**: direct methods for solving systems of linear equation, viz., Gauss elimination, LU Decomposition, Cholesky decomposition, Iterative methods.

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FOUNDATION COURSE

(For those candidates who want to opt for **Education/ Psychology** as one of the options).

Total : 100 Marks

Time: 3 Hours

Unit I. Education in Ancient, Medieval and British India

- Synoptic study of Brahminic, Buddhist and Islamic Education in Ancient and Medieval India with respect to: Aims and Objectives, Subjects of study, Methods of teaching, Teacher –Pupil relationship, Assessment of Learning and Women's Education
- Charter Act of 1813
- Anglicist –Orientalist controversy -Macaulay's Minute
- The Wood's Despatch of 1854 (Recommendations only)
- Hunter Commission 1882-83 (Primary and Secondary Education)
- Wardha Scheme 1937

Unit II. Development of Education in Post- Independence Era

- Recommendations of various Commissions
  - Indian University Commission(1948-49)
  - Secondary Education Commission(1952-53)
  - Indian Education Commission(1964-66)
  - National Policy of Education(1986,1992, NEP 2020)
- Constitutional Provisions on education with emphasis on article 45 for development of Elementary Education in India with quality perspective
- Contemporary Issues in education- Life Skills Education, Value Education (Concept and Methods), role of Education in Promoting Inclusion: Barriers and Strategies

Unit III. Contribution of Educational Thinkers

- Rabindranath Tagore
- Madam Maria Montessori
- Friedrich Froebel
- Mahatma Gandhi
- Rousseau
- Swami Vivekananda

Unit IV. Learning, Growth & Development

- Learning: Concept, Principles and Theories (Trial & Error, Conditioning and Insightful learning with educational implications)
- Growth & Development: Principles, Characteristics, Stages & Determinants
- Cognitive development in learners: Views of Piaget and Vygotsky with their educational implications
- Motivation: Concept, Types, techniques and its role in learning
- Personality: Concept, types, determinants and theories (Freud, Adler and Jung) with their educational implications
- Adjustment: Process of Adjustment and Defense Mechanism, Adjustment and Mental Health
- Intelligence: Concept, Effects of Heredity and Environment, Multiple Intelligence and Measurement of Intelligence.
- Parenting style: Types of Parenting Styles and their impact on learning
- Learning disability- Meaning, Characteristics & Identification of learning-disabled children, with Approaches & Techniques for children with diverse needs.

Unit V. Teacher Education

- Meaning and Scope of Teacher Education.
- Need for Education of Teachers.
- Teaching as a Profession, Professional Ethics of a Teacher.
- Accountability and Continuous Professional Development for teachers.
- Role of NAAC, NCTE, NCERT, SCERT and DIET for the development and innovative approaches in Teacher Education.

Unit VI. Sociological Foundations of Education

- School as Social System & Agency of Education
- Socialization: Meaning, Concept and Role of family & School in Socialization
- Social Change: Concept and Factors of Social Change
- Social Stratification: Meaning and Factors
- Social Mobility: Types, Factors and Role of Education
- Social Diversity, Multiculturalism and its implications for Education

Unit VII. Curriculum Studies

- Curriculum: Meaning, Nature, Importance and Role in teaching and learning process
- Principles and Approaches of Curriculum Development
- Basic criteria for curriculum development
- Models of curriculum development

Unit VIII. Assessment and Evaluation

- Assessment and Evaluation-Concept, Nature and Purpose
- Assessment in learning and Assessment for learning
- Instructional Objectives: Bloom's Taxonomy (Levels and Assessment)
- Characteristics of a Good Test- Reliability, Validity, Objectivity and Usability
- Types of Tests: Standardized & Teacher made; Norm Referenced and Criterion-Referenced test; Essay and Objective type tests (concept, characteristics and their usage in education)
- Standardized test- Principles andSteps in construction of Standardized test
- Tools and Techniques of Assessment- Concept and uses of Observation, Inquiry and Cumulative Record Cards
- Modern Trends in Assessment: Grading system, Continuous Comprehensive Evaluation, Semester system, and Open Book Examination

Unit IX. Statistics in Education

- Statistics- Use and importance in Education
- Measures of Central tendency – Mean, Median, Mode (Calculation and applications)
- Measures of Variability – Quartile Deviation, Standard Deviation (Calculation and applications)

Unit X. Educational Technology

- Educational Technology- Concept, Need, Types and Functions
- Concepts of 'Technology in Education' and 'Technology of Education'
- Systems Approach to Education: Meaning, Components of a System and Need for Systems Approach in education
- Models of teaching: Nature, Concepts, Uses and Advantages of different families of Teaching Models
- Multimedia Approach in Education

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PHYSICAL EDUCATION

Total (60+40=100 Marks)

Time: 3 Hours

Note Briefly:

1. This paper is divided into two sections- Section A and Section B.
2. Section A is Methodology and carries 60 marks whereas Section B is Content and carries 40 marks.
3. Both the sections are compulsory.

SECTION A : METHODS OF TEACHING
(60 Marks)

UNIT 1. EDUCATIONAL TECHNOLOGY AND METHODS OF TEACHING IN PHYSICAL EDUCATION.

- Teaching technique-lecture method, command method, demonstration method, project method etc.
- Teaching aids, meaning, importance and its criteria for selecting teaching aids.
- Term teaching-meaning, principles and advantages of term teaching.
- Lesson planning-meaning, type and principles of lesson plan.
- Micro teaching-meaning, types and steps of micro teaching.

UNIT 2. SPORTS PSYCHOLOGY AND SOCIOLOGY.

- Meaning, importance and scope of educational and sports psychology.
- General characteristic of various stages of growth and development.
- Learning, law of learning and stages of learning.
- Factor affecting learning and motor training.
- Learning curve, types and characteristic.
- Role of physical education and sports in developing personality, meaning and types of motivation.
- Importance of motivation in learning physical activities and sports.

UNIT 3. SPORTS TRAINING.

- Meaning and definition of sports training.
- Aim and objective of sports training.
- Characteristics and principles of sports training.
- Training load-definition and type of training load.
- Periodization meaning and types of periodization.

UNIT 4. MEASUREMENT AND EVALUATION IN PHYSICAL EDUCATION.

- Definition and meaning of test, measurement and evaluation in Physical Education
- Need and importance of test, measurement and evaluation in physical education
- Inter relationship between test, measurement and evaluation.
- Different types of testing procedure in Physical Education and sports, Factor affecting test, measurement and evaluation.
- Criteria, classification and administration of tests- criteria of good test, criteria of test, scienctific, authentic (reliability, objectivity, validity, availability of norms).
- Types and classification of test.
- Specific components of physical fitness-strength, speed, flexibility, endurance.
- Assessment of physical fitness.
- Assessment of motor fitness.

SECTION B : CONTENT
(40 Marks)

UNIT 5 . FOUNDATIONS OF PHYSICAL EDUCATION

- Terminology of Physical Education –old and modern.
- Importance of Physical Education in present era.
- Misconceptions about Physical Education.
- Olympic moment – Ancient and Modern Olympics.
- Socializing process through games and sports.
- Physical Education in India (After 1947).

UNIT 6. HEALTH EDUCATION

- Concept, aim, objectives and principle of Health Education.
- Health-meaning, concept, dimension, factor affecting health.
- Relation between Physical and Mental Health.
- Causes of mental illness – anxiety, frustration, tension, stress etc.
- Personal and Environmental hygiene for schools.
- Posture and postural deformities-factor affecting posture, postural deformities and their corrections-kyphosis, lordosis, flat foot, knock-knee etc.
- Drugs, drug abuse-Adverse affect of drug on the health of individuals.

UNIT 7. YOGA EDUCATION

- Meaning and definition of Yoga.
- Need and importance of Yoga in Physical Education and sports.
- Effects of asanas and pranayama on various system of the bodies.
- Difference between Yogic practices and Physical Exercises.
- Method of teaching Yoga.
- Yoga and Health.
- Eight limbs of Yoga.

UNIT 8. ANATOMY AND EXERCISE PHYSIOLOGY.

- Meaning and concept, need and importance of the knowledge of anatomy and exercise. physiology in the field of Physical Education.
- Anatomical structure of human body-cells, tissues, organs and organ systems.
- Skeletal system-structure and function and joints-types of joints.
- Muscular system-types, structure of muscles, names of muscles.
- Cardio-vascular system-structure and functions.
- Respiratory system-structure and function.
- Nervous system-structure and function.
- Effect of exercise-short term and long term on the systems of body.

UNIT 9. SPORTS MANAGEMENT.

- Need, scope and importance of sports management.
- Importance and principles of officiating

- Basic structures of management in Physical Education of school and basic skills of sports management.
- Administration of tournaments.
- Intramural and extramural-basic principles and methods.
- Types of tournaments-league, knockout, league cum knockout, consolation, preparation of fixture for tournament/competitions.

UNIT 10. SPORTS MEDICINE.

- Sports medicine-meaning, definition, aim, objectives, modern concept and importance.
- Need and importance of the study of sports injuries in the field of Physical Education.
- First aid treatment-contusion, strain, sprain, fracture, dislocation and cramps, bandages-type of bandages.
- Importance of physiotherapy, principles of physiotherapy.

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