

ANNEXURE-III**Scheme and Syllabus for the post of Junior Lecturers in Residential Educational Institution Societies****Preliminary (Screening Test)
Scheme of Examination**

Written Examination (Objective Type)		No. of Questions	Duration (Minutes)	Marks
Paper	General Studies, General Abilities and Basic Proficiency in English	150	150	150

Syllabus**Paper: General Studies, General Abilities and Basic Proficiency in English****Section-I: General Studies**

1. Current Affairs – Regional, National & International.
2. Indian Constitution; Indian Political System; Governance and Public Policy.
3. Social Exclusion; Rights issues such as Gender, Caste, Tribe, Disability etc.and inclusive policies.
4. Society Culture, Civilization Heritage, Arts and Literature of India and Telangana
5. General Science; India's Achievements in Science and Technology
6. Environmental Issues; Disaster Management- Prevention and Mitigation Strategies and Sustainable Development.
7. Economic and Social Development of India and Telangana.
8. Socio-economic, Political and Cultural History of Telangana with special emphasis on Telangana Statehood Movement and formation of Telangana state.

Section-II: General Abilities

9. Analytical Abilities: Logical Reasoning and Data Interpretation.
10. Moral Values and Professional Ethics in Education.
11. Teaching Aptitude

Section – III: Basic Proficiency in English**i) School Level English Grammar:**

Articles; Tense; Noun & Pronouns; Adjectives; Adverbs; Verbs;
Modals; Subject-Verb Agreement; Non-Finites; Reported Speech;
Degrees of Comparison; Active and Passive Voice; Prepositions;
Conjunctions; Conditionals.

ii) Vocabulary:

Synonyms and Antonyms; Phrasal Verbs; Related Pair of Words;
Idioms and Phrases; Proverbs.

iii) Words and Sentences :

Use of Words ; Choosing Appropriate words and Words often
Confused; Sentence Arrangement, Completion, Fillers and

Improvement; Transformation of Sentences ; Comprehension;
Punctuation; Spelling Test; Spotting of Errors.

Main Examination Scheme and Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Scheme of Examination

Written Examination (Objective Type)		No. of Questions	Duration (Minutes)	Marks
Paper – I	Pedagogy Across the Curriculum (Common Syllabus)	100	90	100
Paper – II	Concerned Subject (PG level)	200	180	200
Interview/ Demonstration /viva-voce				30
Total				330

Syllabus

Paper – I: Pedagogy Across the Curriculum (Common Syllabus)

- I. The History and Nature of liberal disciplines of knowledge. Importance of Cognitive and Non-Cognitive areas in Education.
- II. Values, Aims and Objectives of Teaching Liberal and Creative Disciplines of Knowledge including Vocational subjects, Crafts, Performance and Fine arts etc.
- III. Psychology of Human Development; Psychology of Teaching and Learning.
- IV. Curriculum : Construction ,Organization and Development
- V. Approaches, Methods and Techniques of Teaching Disciplines of Knowledge
- VI. Planning for Effective Instruction : Different Plans and Designing Learning Experiences.
- VII. Learning Resources and Designing Instructional Material ; Labs; Teaching Aids ; Textbooks; ICT integration; OERs (Open Educational Resources).
- VIII. Measurement and Evaluation : Continuous and Comprehensive Evaluation (CCE) ; Tools and Techniques of Evaluation; Achievement and Diagnostic Tests. Critical approach to assessment and evaluation.
- IX. Learning Disabilities; Learning Difficulties and Education of Exceptional and Disabled Children
- X. Disciplines of Knowledge and Everyday Life ; Non-formal Education in the Institutions of Learning.
- XI. Pedagogical Concerns: Quality and Academic Standards; Teaching and Its relationship with Learning and Learner, Learners in Contexts: Situating learner in the Socio-Political and Cultural Context ; Managing Behavior problems, Guidance & Counseling, Punishment and Its legal implications, Rights of a Child, Time Management, Distinction between Assessment for Learning and Assessment of Learning, School Based Assessment, Continuous and Comprehensive Evaluation; Understanding Teaching and Learning in the context of NCF and Right to Education Act.

Main Examination Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Paper – II

Paper: తెలుగు

(ఎ) సంప్రదాయ సాహిత్యకవుల అధ్యయనం - కాలం - రచనలు

నన్నయ, తిక్కన, ఎర్రన, శివకవులు (నన్నెచోడుడు, మల్లికార్జున పండితారాధ్యుడు, పాల్కురికి సోమనాథుడు), నాచనసోమన - భాస్కర రామాయణ కావులు, రంగనాథ రామాయణ కవి - శ్రీనాథుడు - పోతన - పిల్లలమర్రి పినవీరభద్రుడు - గౌరన - అనంతామాత్యుడు - కొరవి గోపరాజు - నంది మల్లన, ఘంట సింగన - అష్టదిగ్గజ కవులు - తాళ్ళపాక కవులు - పొన్నగంటి తెలగన్న - చేమకూర వెంకటకవి - తంజావూరు రాజకవులు కవయిత్రులు - కందుకూరి రుద్రకవి, మడికి సింగన

(బి) వేమన తాత్త్వికత - సమకాలిక పరిశీలన, దృక్పథం - సమాజంపై వేమన కవిత్వ ప్రభావం.

సాహిత్య ధోరణుల అధ్యయనం - యుగప్రభావం - రూపాలు - మొదలైనవి. ఇతిహాసం - పురాణం ప్రబంధం - శతకం - సంకీర్తన సాహిత్యం - చారిత్రక కావ్యం - సంప్రదాయ, ఆధునిక గద్య రచనలు - నవల - కథానిక - వ్యాసం - ఏకాంకిక మొదలైనవి - వాదాలు (దళిత, హేతు, స్త్రీ, మైనారిటీ , బి.సి. ప్రాంతీయ)

జానపద విజ్ఞానం - గేయాలు - కతాగేయాలు - గద్యాభ్యాసాలు - (పురాణగాథలు - ఐతిహ్యాలు - కథలు), సామెతలు - పొడుపుకథలు - జానపద కళలు - (వీధి నాటకాలు, యక్షగానాలు, బొమ్మలాటలు,, పగటి వేషాలు, చిందు, ఒగ్గు, జాతర కళారూపాలు.

ఆధునిక కవులు అధ్యయనం - ఆధునిక ధోరణులు వారి రచనలు - గురజాడ - రాయప్రోలు - వీరేశలింగం - విశ్వనాథ - దేవులపల్లి - బసవరాజు - పింగళి - కాటూరి - దువ్వూరి - పుట్టపర్తి - శ్రీశ్రీ - కాళోజి, దాశరథి, సి. నారాయణ రెడ్డి , ఎన్. గోపి - ప్రసిద్ధ ఆధునిక కవులు - భావ, అభ్యుదయ, విప్లవ, - దిగంబర, చేతనావర్తన కవులు.

తెలుగు వ్యాకరణ, ఛందస్సు అధ్యయనం:

వ్యాకరణం - బాల వ్యాకరణం (సంజ్ఞ, సంధి, క్రియా, తత్సమ, ఆచ్చిక ప్రకరణాలు ఛందస్సు - వృత్తాలు, జాతులు, ఉపజాతులు (ఉత్పలమాల, చంపకమాల, శార్దూలం, మత్తేభం, ద్విపద, తరువోజ , సీసం, కందం, స్రగ్ధర , పంచచామరం) అలంకారాలు - అర్థాలంకారాలు, శబ్దాలంకారాలు తెలుగు భాషా చరిత్ర పరిణామం - (ప్రాజ్ఞన్నయ యుగం నుండి నేటి వరకు) - ద్రావిడ భాషా కుటుంబాలలో తెలుగు స్థానం - భౌగోళిక విభజన - మాండలికాలు.

భాషా విజ్ఞాన అధ్యయనం - భాషా శాస్త్రం, అర్థ విపరిణామం - ఆధునిక కాలం, శాసన భాష నుండి సాహిత్య భాష వరకు (వ్యావహారిక భాష ఉద్యమం వంటివి

తెలుగు సాహిత్య పరిణామం (ప్రాజ్ఞన్నయ యుగం నుండి నేటి వరకు) సాందర్య, సాహిత్య విమర్శ అధ్యయనం (ఫ్రాక్, పశ్చిమ) ఆధునిక తెలుగు సాహిత్య విమర్శ. సంస్కృత వ్యాకరణం - కావ్యాలు - సంస్కృత వ్యాకరణం ప్రాథమిక విజ్ఞానం, సామాన్య ప్రామాణిక గద్య, పద్య పాఠ్యాంశాలు - హితోపదేశం, కాళిదాసుని కృతులు, సంస్కృత పంచకావ్యాల పరిచయం.

Main Examination Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Paper – II: English

I. Genres, Movements, Schools, Concepts.

- Renaissance-Reformation, Metaphysical poetry, Neo-classicism, Puritanism, Restoration, Romanticism, Victorian Age, Realism-Naturalism, Expressionism, Symbolism, Modernism, Postmodernism.
- Structuralism, Poststructuralism, Feminism, Postcolonialism, Diaspora, Race Gender and Caste.
- English Literary Criticism from Philip Sydney to Matthew Arnold
- New Criticism, Formalism, Archetypal criticism, New Historicism, Psychoanalytical criticism, Reader response criticism.
- Literary Genres: Poetry, Fiction, Prose, Drama (origins and development, elements, forms, types)

II. Writers and Texts

- | | |
|-----------------------|---|
| • Christopher Marlowe | Doctor Faustus |
| • William Shakespeare | Hamlet |
| • John Milton | Paradise Lost-Book 1 |
| • William Wordsworth | "Immortality Ode", Tintern Abbey |
| • Robert Browning | "My Last Duchess", "Andrea del Sarto" |
| • Thomas Hardy | Tess of the d' Urbervilles |
| • TS Eliot | The Waste Land |
| • G.B. Shaw | Saint Joan |
| • Virginia Woolf | "A Room of One's Own" |
| • William Golding | Lord of the Flies |
| • Walt Whitman | "When Lilacs Last in the Dooryard
Bloomd", "Crossing Brooklyn Ferry" |
| • Arthur Miller | Death of a Salesman |
| • Toni Morrison | Beloved |
| • Mulk Raj Anand | Untouchable |
| • Kamala Das | "An Introduction", "The Old Playhouse" |
| • Girish Karnad | Hayavadana |
| • Salman Rushdie | Midnight's Children |
| • Chinua Achebe | Things Fall Apart |
| • Margaret Atwood | Edible Woman |
| • Derek Walcott | Dream on Monkey Mountain |

III English Language Teaching

1. ELT in India : (History and status of English in India; English as Second Language, English as Foreign Language, and English as Global Language).
2. Methods and Approaches: (Grammar Translation method, Direct method, Audio-Lingual method; Structural approach, Communicative language teaching)
3. Teaching of Language Skills : (Teaching of Listening, Speaking, Reading, and Writing Skills; Teaching of Grammar and Functional English; Teaching of Vocabulary; Classroom techniques; Use of authentic materials) Teaching literature.
4. Testing and Evaluation: (Principles, Types, Objectives of testing and evaluation)

5. Phonetics and Phonology; Syntax and Structure.

IV. Literary comprehension-(Excerpts from poetry and prose for comprehension

Main Examination Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Paper - II: Sanskrit

I. Vedic Literature

Dieties: Agni, Indra, Varuna, Usas, Aksha, Vak, Sarama – Pani, Visvamitra – Nadi.
Subject matter of Samhitas, Brachmanas, Aranyakas, Upanisads.

History of Vedic Literature

Main theories regarding the age of Rigveda – Maxmuller, A Weber, Jacobi,
Balagangadara Tilak, M. Winternitz, Indian traditional views.

Vedangas

Siksa, Kalpa, Vyakarana, Niruktam, Chandas, Jyotisa.

II. Darasana

- i) Samkhyakarika of Isvarakrishna, Satkaryavada, Purusa-svarupa, Prakriti Svarupa, Sristikrama, Pratyayasarga, Kaivalya.
 - ii) Vedantasara of Sadananda. Anubandha, Catustaya, Ajnana, Adhyaropa – Apavada, Lingasarirotpatti, Pancikarana, Vivarata, Jivanmukti.
 - iii) Tarkabhasa of Kesavamisra / Tarkasamgraha of Annambhatta: Padartha, Karana, Pramana, Pratyksa, Anumana, Upamana, Sabda.
 - iv) Sarvadarsanasamgraha: Jainism, Buddhism, Charvak
 - v) Yogasutra – Vyasabhasya
Cittabhumi, Cittavrittis, Concept of Isvara, Yogangas, Samadhi, Kaivalya.
- 1) Grammar, Linguistics, Prosody:
 - Grammar
 - Siddhantakanmudi
Definition – Samhita, Guna, Vriddhi, Pratipadika, Nadi, Ghi, Upadha, Aprikta, Gati, Pada, Vibhasa, Savarna, Karaka
Samasa
Tinamta (Bhu and Edha only)
Kridanta (Krityaprakriya only)
Taddhita (Matvarthiya)
Stripratyaya
 - ii) Mahabhasya (Paspasahnika)
Definition of Sabda
Relation between Sabda and Artha
Purposes of the Study of Grammar
Definition of Vyakarana.
Result of the proper use of Sabda
Method of Grammar
 - 2) Linguistics.
 - Paniniyasiksa
 - Definition and types of languages, Genealogical and Morphological classification of languages, Speech mechanism and classification of sounds: Stops, Fricatives, Semi-Vowels and Vowels, Phonetic Laws, (Grimm, Grassmann and Verner)

Characteristics of the three types of Indo Aryan
Causes of Phonetic – change.
Directions of semantic change and reasons
Definition of Vakya and its types.
Discourse Analysis (Mahavakyavicara)
Difference between Bhasa and Vak
Difference between Language and Dialect.

iii) Niruktam, (Chapter 1 and 2 only)

Four fold division of Padas,
 Concept of Nama,
 Concept of Akhyata,
 Meaning of upasarga,
 categories of Nipatas,
 Six states of action (Sadbhavikaras)
 Purposes of study of Niruktam,
 Principles of Etymology.
 Etymology of following words, Acarya, Vira, Hrada, Go, Samudra, Vritra,
 Aditya, Usas, Megha,
 Vak, Udaka, Nadi, Asva, Agni, Jatavedas, Vaisravana, Nighantu.

iv) Purana and Itihasa.

Definition of Purana, Mahapuranas and Upapuranas.

• Ramayana

Arrangement of Ramayana
 Legends in Ramayana
 Society in the Ramayana
 Ramayana as a source of later Sanskrit works
 Literary value of the Ramayana

• Mahabharata

Arrangement of Mahabharata
 Legends in Mahabharata
 Society in the Mahabharata
 Mahabharata as a source of later Sanskrit works
 Literary value of the Mahabharata

v) Kavyasastra

• Kavyaprakasha

Kavyalakshana, kavyaprayojana, Kavyahetu, kavyabheda, Sabdasakti,
 Abhilitanvayavada, Anvitatbhidanavada, Concept of Rasa and discussion of
 Rasasutra
 Alankaras, Anuprasa, Slesa, Vakrokti, Upama, Rupaka, Utpreksha, Samasokty,
 Apahnuti, Nidarshana, Arthantaranyasa, Dristanta, Vibhavana, Visesokti,

Kavyalinga.

• Dhvanyaloka (I Udyota)

• Dasarupaka (3rd Chapter only)

vi) Poetry, Prose, Dramas and History of Sanskrit Literature

i) Poetry

Raghuvamsa (I and XIV cantos)
 Kumarasambhava (V canto)
 Kiratarjuniya (I canto)
 Sisupalavadha (II canto)
 Naisadhiyacarita (I canto)

ii) Prose

Dasakumaracaritam (VIII chapter)
 Harshacharitam (V Chapter)
 Kadambari (Shudrakavarnanam & Shukanasopadesha)

iii) Dramas

Svapnavasavadatta.
 Abhijnanasakuntalam
 Mrichakatikam
 Uttrararamacharitam
 Mudrarakshasam
 Ratnavali
 Pratimanatakam

i) History of Sanskrit Literature
 Mahakavyas

Lagukavyas
 Historicalkavyas
 Lyric Poetry
 Campukavyas
 Gadyakavyas
 Didactic Poetry

- (VII) (i) Kautilya's Arthasastra (First ten Adikaras)
 (ii) Manusmriti (I, II, and VII Adhyayas)
 (iii) Yajnavalkyasmriti (Vyavaharakanda only)
 (iv) Susritasamhita (Sutrasthana and Ojah Kshayah)

(VIII) General Translation
 (Sanskrit to English and English to Sanskrit)

Main Examination Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Paper – II: Mathematics

I. Real Analysis

Finite, Countable and Uncountable sets – Real Number system \mathbb{R} – Infimum and Supremum of a subset of \mathbb{R} – Bolzano- Weierstrass Theorem- Sequences- Convergence- Limit Superior and Limit Inferior of a Sequence- Sub sequences- Heine-Borel Theorem- Infinite Series – Tests of Convergence- Continuity and Uniform continuity of a real valued function of a real variable- Monotonic Functions - Functions of Bounded Variation- Differentiability and Mean Value Theorems- Riemann Integrability- Sequences and Series of Functions

II. Metric Spaces

Metric spaces – Completeness- Compactness- Connectedness – Continuity and Uniform continuity of a function from one metric space into another-Topological Spaces – Bases and Subbases – Continuous functions

III. Elementary Number Theory

Primes and Composite numbers – Fundamental Theorem of Arithmetic – Divisibility – Congruences – Fermat's theorem – Wilson's Theorem – Euler's Phi - Function

IV. Group Theory

Groups- Subgroups- Normal Subgroups- Quotient groups- Homomorphisms- Isomorphism Theorems- Permutation groups- Cyclic groups- Cayley's theorem. Sylow's theorems -Their applications

V. Ring Theory

Rings- Integral domain- Fields- Subrings - Ideals – Quotient rings – Homomorphisms – Prime ideals- Maximal ideals – Polynomial rings – Irreducibility of polynomials – Euclidean domains- Principal ideal domains

VI. Vector Spaces

Vector Spaces, Subspaces – Linear dependence and independence of vectors – basis and dimension – Quotient spaces – Inner product spaces – Orthonormal basis – Gram-Schmidt process

VII. Theory of Matrices

Linear Transformations – Rank and nullity – Change of bases- Matrix of a Linear Transformation – Singular and Non-singular matrices – Inverse of a matrix – Eigenvalues and Eigenvectors of a matrix and of a Linear Transformation – Cayley-Hamilton's theorem- Quadratic forms- Signature

and Index

VIII. Complex Analysis

Algebra of Complex Numbers – The Complex Plane – Complex Functions and Their Analyticity – Cauchy-Riemann equations – Mobius transformations- Power Series- Complex Integration – Cauchy's Theorem – Morera's Theorem – Cauchy's Integral Formula – Liouville's Theorem – Maximum Modules Principle – Schwarz's Lemma – Taylor's Series – Laurent's Series-Calculus of Residues – Evaluation of Integrals

IX. Ordinary Differential Equations

Ordinary Differential Equations (ODE) of First order and First degree – Different methods of solving them – Exact Differential equations and Integrating factors- ODE of First order and Higher degree – Equations solvable for p , x and y – Clairaut's equations – Singular Solutions- Linear Differential Equations with Constant Coefficients and Variable Coefficients – Variation of Parameters

X. Partial Differential Equations

Formation of Partial Differential Equations (PDE) – Lagrange and Charpit's methods for Solving first order PDEs – Cauchy problem for first order PDEs- Classification of Second Order PDE's – General Solution of Higher Order PDEs with Constant Coefficients

XI. Solid Geometry

The Plane- Right line- Sphere- Cones and Cylinders

Main Examination Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Paper - II: Physics

I. Mathematical Methods of Physics

Dimensional analysis, vector algebra and vector calculus. Linear algebra, matrices, Cayley-Hamilton Theorem. Eigen values and eigenvectors. Linear ordinary differential equations of first & second order, special functions (Hermite, Bessel, Laguerre and Legendre functions). Fourier series, Fourier and Laplace transforms. Elements of complex analysis, analytic functions; Taylor & Laurent series: poles, residues and evaluation of integrals. Elementary probability theory, random variables, binomial, Poisson and normal distributions. Central limit theorem.

II. Classical Mechanics

Newton's laws. Dynamical systems, Phase space dynamics, stability analysis. Central force motions. Two body collisions-scattering in laboratory and centre of mass frames. Rigid body dynamics-moment of inertia tensor. Non-inertial frames and pseudo forces. Variational principle. Generalized coordinates. Lagrangian and Hamiltonian formalisms and equations of motion. Conservation laws and cyclic coordinates. Periodic motion: small oscillations, normal modes. Special theory of relativity-Lorentz transformations, relativistic kinematics and mass-energy equivalence.

III. Electromagnetic Theory

Electrostatics: Gauss's law and its applications, Laplace and Poisson equations, boundary value problems. Magnetostatics: Biot-savart law, Ampere's theorem. Electromagnetic induction. Maxwell's equations in free space and linear isotropic media; boundary conditions on the fields at interfaces. Scalar and vector potentials, gauge invariance. Electromagnetic waves in free space. Dielectrics and conductors. Reflection and refraction, polarization, Fresnel's law, interference, coherence and diffraction. Dynamics of charged particles in static and uniform electromagnetic fields. Charges particles in inhomogeneous fields.

IV. Quantum mechanics

Wave-particle duality. Schrodinger equation (time-dependent and time-independent). Eigen value problems (particle in a box, harmonic oscillator, etc.). Tunneling through a barrier. Wave function in coordinate and momentum representations. Commutators and Heisenberg uncertainty principle. Dirac notation for state vectors. Motion in a central potential: Orbital angular momentum, angular momentum algebra, spin, addition of angular momenta; Hydrogen atom. Stern-Gerlach experiment. Time independent perturbation theory and applications. Variational method. Time dependent perturbation theory and Fermi's golden rule. Selection rules. Identical particles. Pauli exclusion principle. Spin-statistics connection.

V. Thermodynamics and statistical Physics

Laws of thermodynamics and their significance. Thermodynamic potentials, Maxwell relations, chemical potential, Phase equilibrium. Phase space. Micro and macro- states. Micro-canonical, canonical and grand-canonical ensembles and partition functions. Free energy and its connection with thermodynamic quantities. Classical and quantum statistics. Bose and Fermi gases. Principle of detailed balance. Black body radiation and Planck's distribution law

VI. Electronics

Semiconductor devices (diodes, junctions, transistors, field effect devices, homo- and hetero junction devices), device structure, device characteristics, frequency dependence and applications. Opto-electronic devices (solar cells, photo detectors, LEDs). Rectifiers and power supplies. Feedback amplifiers and their frequency response. Oscillators, Multivibrators. Operational amplifiers and their applications, Digital techniques and applications (Logic circuits, registers, counters and Comparators). A/D and D/A converters. Microprocessors, micro controller basics.

Fundamentals of AM communication, FM communication and Fibre optic communication and their techniques.

VII. Atomic & Molecular Physics

Quantum States of an electron in an atom. Electron spin. Spectrum of Helium and alkali atom. Relativistic corrections for energy levels of hydrogen atom, hyper fine structure and isotopic shift, width of spectrum lines, LS & JJ couplings. Zeeman, Paschen-Bach & Stark effects. Frank-Condon principle. Electronic rotational, vibrational and Raman spectra of diatomic molecules. Selection rules. Lasers: spontaneous and stimulated emission, Einstein A & B coefficients. Optical pumping, Population inversion, rate equation. Modes of resonators and coherence length.

VIII. Condensed Matter Physics

Bravais lattice. Reciprocal lattice. Diffraction and the structure factor. Bonding of solids. Elastic properties, Phonons, lattice specific heat. Free electron theory and electronic specific heat. Response and Relaxation phenomena. Drude model of electrical and thermal conductivity. Hall Effect and thermoelectric power. Electron motion in a periodic potential, band theory of solids; metals, insulators and semiconductors. Super conductivity: Type-I and type-II super conductors. Josephson junctions. Superfluidity. Defects and dislocations. Ordered phases of matter: translational and orientation order, kinds of liquid crystalline order. Quasi crystals.

IX. Nuclear and Particle Physics

Basics of radio activity. Basic nuclear properties; size, shape and charge distribution, spin and parity. Binding energy, Semi-empirical mass formula, liquid drop model. Nature of the nuclear force, form of nucleon-nucleon potential, charge –independence and charge symmetry of nuclear forces. Deuteron problem. Evidence of shell structure, single-particle shell model, its validity and limitations. Elementary ideas of alpha, beta and gamma decays and their selection rules. Fission and fusion. Nuclear reactions. Reaction mechanism, compound nuclei and direct reactions.

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Paper – II: Chemistry

Inorganic Chemistry:

1. Atomic structure and chemical bonding – structure and bonding in homo and hetero nuclear molecules. Application of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules.
2. Chemistry of main group (I to VII & Nobel gases) elements.
3. Chemistry of transition elements and inner transition elements.
4. General principles of metallurgy: Occurrence of metals , Concentration of ores - levigation, magnetic separation, froth floatation, leaching , Extraction of crude metal from concentrated ore-conversion to oxide, reduction of oxide to the metal , Thermodynamic principles of metallurgy-Ellingham diagram limitations, applications. Extraction of iron, copper and zinc from their oxides, Electrochemical principles of metallurgy, Oxidation and reduction, Refining of crude metal-distillation, liquation poling, electrolysis, zone refining and vapour phase refining, Uses of aluminium, copper, zinc and iron. Alloys: Inter-metallic compounds
5. Coordination Chemistry –IUPAC nomenclature, bonding theories – Werner's theory, EAN rule, VBT, Crystal Field Theory – Crystal Field splitting patterns in various geometries, Factors affecting on CFT. Calculation of CFSE – John Teller effect – Isomerism in complexes. Spectral and magnetic properties of Coordination complexes – Russell Sanders coupling – term symbols - charge transfer spectra of complexes.
6. Stability of metal complexes – Stepwise and overall stability constants – Factors affecting the stability of metal complexes - Chelate effect. Pearson's theory of hard and soft acids and bases (HSAB).
7. Reaction mechanism of metal complexes–Inert and labile complexes – Ligand substitution reaction of octahedral complexes – Acid hydrolysis, Base hydrolysis – Conjugate base mechanism – Anation reactions – Substitution reactions of square planar complexes – Trans effect – Electron transfer reactions – Inner and outer sphere mechanisms.
8. Metal carbonyls, Nitrosyls and Metallocenes - Structure and bonding.
9. Bio-inorganic chemistry- Metal complexes as oxygen carriers-Hemoglobin and myoglobin-Oxygen transport – Non heme proteins – Hemerythrin and hemocyanin.
10. Analytical chemistry- Chromatography – General principles involved in separations by Paper, Thin layer, Column Chromatography, GC and HPLC.

Physical Chemistry:

11. Solutions and colligative properties: Types of solutions, Expressing concentration of solutions mass percentage, volume percentage, mass by volume percentage, parts per million, mole fraction, molarity and molality, Solubility: Solubility of a solid in a liquid, solubility of a gas in a liquid, Henry's law, Vapour pressure of liquid solutions: vapour pressure of liquid-liquid solutions. Raoult's law as a special case of Henry's law -vapour pressure of solutions of solids in liquids, Ideal and non-ideal solutions, Colligative properties and determination of molar mass - Relative lowering of vapour pressure, elevation of boiling point, Depression of freezing point, Osmosis and osmotic pressure-reverse osmosis and water purification. Abnormal molar masses - van't Hoff factor. Phase equilibria– Phase rule and its application to one component and two component systems

12. Acids and bases: Acids, bases and salts- Arrhenius, Bronsted-Lowry and Lewis concepts of acids and bases. Ionisation of Acids and Bases – Ionisation constant of water and its ionic product- pH scale ionisation constant of weak acids and weak bases- relation between K_a and K_b . Di and poly basic acids and di and poly acidic Bases- Factors affecting acid strength- Common ion effect in the ionization of acids and bases- Hydrolysis of salts and pH of their solutions. Buffer solutions.
13. Thermodynamics: Brief review of concepts of I and II laws of thermodynamics. Concept of entropy. Entropy as a state function. Calculation of entropy changes in various processes. Entropy changes in an ideal gas. Entropy changes on mixing of ideal gases. Entropy as a function of V and T . Entropy as a function of P and T . Entropy change in isolated systems- Clausius inequality. Entropy change as criterion for spontaneity and equilibrium. Third law of thermodynamics. Evaluation of absolute entropies from heat capacity data for solids, liquids and gases. Standard entropies and entropy changes of chemical reactions. Helmholtz and Gibbs free energies (A and G). A and G as criteria for equilibrium and spontaneity. Physical significance of A and G . Driving force for chemical reactions- relative signs of ΔH and ΔS . Thermodynamic relations. Gibbs equations. Maxwell relations. Temperature dependence of G . Gibbs- Helmholtz equation. Pressure dependence of G . Chemical potential: Gibbs equations for non-equilibrium systems. Material equilibrium. Phase equilibrium. Clapeyron equation and Clausius-Clapeyron equation. Conditions for equilibrium in a closed system. Chemical potential of ideal gases. Ideal-gas reaction equilibrium- derivation of equilibrium constant. Temperature dependence of equilibrium constant - The Van't Hoff equation.
14. Electrochemistry: Conductance and its applications, Derivation of Nernst equation. Chemical and concentration cells (with and without transference). Liquid junction potential – derivation of the expression for L J P – its determination and elimination. Applications of EMF measurements: Solubility product, potentiometric titrations, determination of transport numbers, equilibrium constant measurements. Decomposition potential and its significance. Electrode polarization – its causes and elimination. Concentration over potential. Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient. Debye-Huckel theory of electrolytic solutions. Debye-Huckel limiting law. Calculation of mean ionic activity coefficient. Limitations of Debye-Huckel theory. Extended Debye-Huckel law. Theory of electrolytic conductance. Derivation of Debye-Huckel-Onsager equation – its validity and limitations. Concept of ion association – Bjerrum theory of ion association (elementary treatment) - ion association constant – Debye-Huckel-Bjerrum equation.
15. Quantum chemistry: Black body radiation- Planck's concept of quantization- Planck's equation, average energy of an oscillator. Wave particle duality and uncertainty principle - significance for microscopic entities. Emergence of quantum mechanics. Wave mechanics and Schrödinger wave equation. Operators - operator algebra: Commutation of operators, linear operators, Complex functions, Hermitian operators. Operators and. Eigen functions and Eigen values. Degeneracy. Linear combination of Eigen functions of an operator. Well behaved functions. Normalized and orthogonal functions. Postulates of quantum mechanics. Physical interpretation of wave function. Observables and operators. Measurability of operators. Average values of observables. The time dependent Schrodinger equation. Separation of variables and the time-independent Schrodinger equation.
16. Chemical kinetics: Theories of reaction rates - Collision theory, Transition state theory, Reaction coordinate, activated complex and the transition state. Thermodynamic formulation of transition state theory. Unimolecular reactions and Lindeman's theory.
17. Photochemistry: Electronic transitions in molecules - The Franck Condon principle. Electronically excited molecules- singlet and triplet states. Radiative life times of excited states-theoretical treatment. Measured lifetimes. Quantum yield and its determination. Actinometry - ferrioxalate and uranyl oxalate actinometers. Derivation of fluorescence and phosphorescence

quantum yields. E-type delayed fluorescence- evaluation of triplet energy splitting (?EST). Laws of photo chemistry, Photo physical processes, photo physical kinetics of unimolecular reactions. Calculation of rate constants of various photo physical processes, State diagrams, photochemical primary processes. Types of photochemical reactions- electron transfer, photo dissociation, addition, abstraction, oxidation and isomerisation reactions with examples. Effect of light intensity on the rates of photochemical reactions. Photosensitization. Quenching-Stern Volmer equation. Experimental set up of a photochemical reaction. Introduction to fast reactions- Principles of flash photolysis.

18. Solid state chemistry: General characteristics of solid state. Classification of crystalline solids based on different binding forces, probing the structure of solids: X-ray crystallography, Crystal lattices and unit cells. Bravais lattices- primitive and centred unit cells, Number of atoms in a unit cell (primitive, body centred and face centred cubic unit cell), Close packed structures: Close packing in one dimension, in two dimensions and in three dimensions- tetrahedral and octahedral voids- formula of a compound and number of voids filled- locating tetrahedral and octahedral voids, Packing efficiency in simple cubic, bcc and in hcp, ccp lattice. Calculations involving unit cell dimensions density of the unit cell. Imperfections in solids-types of point defects- stoichiometric and non-stoichiometric defects. Magnetic properties of solids- classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of para magnetism. Magnetic properties of solids - classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of para magnetism Electronic properties of metals, insulators and semi conductors: Electronic structure of solids, Band theory, band structure of metals, insulators and semiconductors. Electrons holes and excitons. The temperature dependence of conductivity of extrinsic semi conductors. Photo conductivity and photovoltaic effect.

Organic Chemistry:

19. IUPAC nomenclature of organic molecules. Isomerism – classification of isomers.
20. Classification, preparations and properties of alkane, alkenes, alkynes, cyclo alkanes, aromatic hydrocarbons, halogen compounds, hydroxy compounds, carbonyl compounds, carboxylic acids and its derivatives.
21. Stereo chemistry: Molecular representations (Wedge, Fisher, Newman and Sawhorse projection formula) their description and interconversions. Stereoisomers – classification- configuration- R,S- Nomenclature, criteria for chirality, Axial chirality of allenes, spiranes, alkylidenes, Cycloalkanes, chiral biaryls - Atropisomerism. Planar chirality of ansa compounds and trans- cyclooctene. Helical chiral compounds. Determination of absolute configuration by chemical correlation methods. Determination of configuration in E,Z- nomenclature. Spectral and chemical methods for determination of E, Z configuration, including aldoxime and ketoximes.
22. Introduction to conformational isomerism, Klyne - Prelog terminology for conformers and torsion angles, dihedral angle, Steric strain and the concept of dynamic stereoisomerism. Study of conformations of acyclic compounds like ethane, butane, dihalobutanes, halohydrin, ethylene glycol, butane-2, 3-diol, amino alcohols and 1,1,2,2-tetrahalobutanes.
23. Nature of bonding in organic molecules and aromaticity, delocalized chemical bonding, conjugation, cross conjugation, resonance, hyperconjugation, tautomerism, Huckel's Rule and the concept of aromaticity-Aromaticity, non-aromaticity and anti aromaticity.
24. Reactive intermediate: Generation, detection, structure, stability and reactivity of carbocation, carbanion, free radical, carbene and nitrene. Molecular rearrangements: definition and classification, molecular rearrangements involving 1). Electron deficient carbon: Wagner - Meerwein, Pinacol-Pinacolone, allylic and Wolf rearrangement. 2). Electron deficient Nitrogen: Hofmann, Lossen, Curtius, Schmidt and Beckmann rearrangements. 3) Electron deficient Oxygen: Baeyer-

Villiger oxidation. 4). Base catalysed rearrangements: Benzylic acid, Favorski, Tran annular, Sommelet-Hauser and Smiles rearrangement.

25. Organic reaction mechanism: Mechanism, stereochemistry and energy profile diagram of Addition reactions to polar and non polar double bonds. Substitution reactions: Mechanism, rate law, stereochemistry and factors affecting on aliphatic and aromatic reactions. Elimination reactions- mechanism, rate law, stereochemistry, orientation and factors affecting on E1, E2, E1CB, pyrolytic syn elimination and anti-elimination, elimination vs substitution. Detection of reaction mechanism by product isolation, isotopic labelling, chemical trapping and crossover experiments.
26. Oxidation- Swern, Cr (VI) oxidants, Oxidative cleavage of 1,2-diols - Periodic acid and Lead tetra acetate.

Reductions - Wilkinsons's catalytic hydrogenation, LiAlH_4 , NaBH_4 , BH_3 , AlH_3 and DIBAL.
27. Heterocyclic chemistry: importance as drugs, nomenclature, classification based on size of the ring, number and nature of hetero atoms. Synthesis and reactivity of Pyrrole, furan, Thiophene, pyridine, Indole, Benzothiophene, Quinoline, Isoquinolines.
28. Alkaloids and Terpenoids- importance as drugs, isolation of natural products by steam distillation, solvent extraction and chemical methods. Structure determination and synthesis of papaverine, nicotine and quinine. General methods in the structure determination of Terpenes, isoprene rule, special isoprene rule, structure determination of a-Terpenol and camphor.
29. Organic photochemistry: photochemical energy, Frank-Condon principle, Jablonski diagram, Electronic transitions, photosensitization, quenching, quantum efficiency, quantum yield, photochemistry of carbonyl compounds $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions. Norrish type-I and Norrish type-II cleavages. Paterno-Buchi reactions, Photoreduction, photochemistry of enones- hydrogen abstraction, rearrangements of α, β -unsaturated ketones and cyclohexadienones, photochemistry of pbenzoquinones, Dienes - photochemistry of 1,3-butadiene, (2+2) additions, Di-p-methane rearrangement, photochemistry of aromatic compounds, excited states of benzene and its 1,2-, 1,4- additions.
30. Pericyclic reactions: Classification, Stereochemistry of pericyclic reactions, Molecular Orbitals and Symmetry of ethylene, 1,3-butadiene, 1,3,5-hexatriene, allylic, 1,3-pentadienyl and 1,3,5-heptatrienyl p- systems. Analysis of pericyclic reactions by PMO, FMO and orbital correlation methods.
31. Basic principles, concepts of UV, IR, ^1H NMR, ^{13}C NMR and Mass spectroscopic methods – structure determination of organic compounds by UV, IR, ^1H NMR, ^{13}C NMR and Mass spectroscopic methods.
32. Green chemistry: Principles of Green chemistry, and its approaches.

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Paper – II: Botany

I **Phycology, Mycology, Bacteria and Viruses**

Phycology : Thallus organization ; cell ultra structure ; reproduction (vegetative, sexual, asexual) ; criteria for classification of algae : pigments, reserve food, flagella ; classification, salient features of Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta ; algal blooms and toxic algae, algal biofertilizers ; algae as food and feed and role of algae in industry.

Mycology : General characters of fungi ; substrate relationship in fungi ; cell ultrastructure ; unicellular and multicellular organization ; cell wall composition ; nutrition (saprobic, biotrophic, symbiotic) ; reproduction (vegetative, asexual, sexual) ; heterothallism ; heterokaryosis parasexuality ; Molecular aspects in classification.

General account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina ; fungi in industry, medicine and as food ; fungal diseases in plants and humans ; Mycorrhizae ; fungi as biocontrol agents.

Bacteria- ultrastructure and biochemistry of cell wall, nutritional types, reproduction, Plasmids.

Viruses- Characters and ultrastructure of virions and symptomatology and transmission of plant viruses. Mollicuties general characters of spiroplasmas and phytoplasmas Importance of micro organisms: Microbes in medicine, agriculture and environment.

II **Bryophyta, Pteridophyta and Gymnosperms**

Bryophyta : Morphology, structure, reproduction and life history ; distribution ; classification., of Marchantiales, Junger maniales, Anthoceratales, Sphagnales, Funariales and Polytrcales ; economic and ecological importance.

Pteridophyta : Morphology, anatomy and reproduction ; classification of Psilopsida, Lycopsidea, Sphenopsida and Pteropsida; evolution of stele ; heterospory and origin of seed habit; general account of fossil pteridophytes.

Gymnosperms- Introduction and classification, Structure and reproduction of Cycadales, Ginkgoales, Coniferales, Ephedrales, Welwitschiales and Gnetales.

III **Taxonomy of Angiosperms**

The species concept: Taxonomic hierarchy, species, genus, family and other categories; principles used in assessing relationship, delimitation of taxa and attribution of rank.

Salient features of the International Code of Botanical nomenclature.

Taxonomic tools: Herbarium; floras; histological, cytological, phytochemical, serological, biochemical and molecular techniques ; computers and GIS.

Systems of angiosperm classification : Phenetic versus phylogenetic systems ; cladistics in taxonomy ; relative merits and demerits of major systems of classification.

Study of the following families- Magnoliaceae, Malvaceae, Rutaceae, Apocynaceae, Asclepiadaceae, Lamiaceae, Amaranthaceae and Poaceae.

IV **Plant Anatomy and Embryology**

Shoot development: Organization of the shoot apical meristem (SAM); control of cell division and cell to cell communication; control of tissue differentiation especially xylem and phloem ; secretory ducts and laticifers.

Phyllotaxy and leaf differentiation

Root development : Organization of root apical meristem (RAM); vascular tissue differentiation; homeotic mutants in Arabidopsis and Antirrhinum,

Male gametophyte: Structure of anthers; microsporogenesis, role of tapetum; pollen development and gene expression; male sterility; sperm dimorphism and

hybrid seed production; pollen germination, pollen tube growth and guidance ; pollen storage ; pollen allergy, pollen embryos.

Female gametophyte: Ovule development; megasporogenesis; organization of the embryo sac, structure of the embryo sac cells.

Pollination, pollen – pistil interaction and fertilization : Floral characteristics, pollination mechanisms and vectors; self-incompatibility; double fertilization.

Seed development and fruit growth: Endosperm development during early, maturation and desiccation stages; embryogenesis, cell lineages during late embryo development; storage proteins of endosperm and embryo; polyembryony; apomixes; embryo culture; fruit maturation.

Dormancy: Seed dormancy; overcoming seed dormancy; bud dormancy.

V Plant Resource Utilisation and Conservation

Origin, evolution, botany, cultivation and uses of (i) Food forage and fodder crops (ii) fibre crops (iii) medicinal and aromatic plants and (iv) vegetable oil-yielding crops. Ethnobotany – Scope and objectives of ethnobotany.

Important fire-wood and timber – yielding plants and non-wood forest products (NWFPs) such as bamboos, rattans, raw materials for paper-making, gums, tannins, dyes, resins and fruits.

Role of plants in Medicine- morphology, active principles and medicinal value of the following plants-Andrographis, Asparagus, Phyllanthus, Gymnema..

Strategies for conservation – in situ conservation : International efforts and Indian initiatives ; protected areas in India – sanctuaries, national parks, biosphere reserves, wetlands, mangroves and coral reefs for conservation of wild biodiversity.

Strategies for conservation – ex situ conservation : Principles and practices; botanical gardens, field gene banks, seed banks, in vitro repositories, cryobanks; general account of the activities of Botanical Survey of India (BSI), National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR) and the Department of Biotechnology (DBT) for conservation, non-formal conservation efforts.

VI Plant Ecology

Climate, soil and vegetation patterns of the world: Life zones; major biomes and major vegetation and soil types of the world.

Vegetation organization: Concepts of community; analytical and synthetic characters of community.

Population characters, interactions of species- positive and negative interactions of species.

Ecological succession: types, changes involved in succession, concept of climax

Biotic and abiotic interactions, habitat and niche, allopatric and sympatric speciation.

Ecosystem organization: Structure and functions; primary production methods of measurement of primary production, ; energy dynamics (trophic organization, energy flow Pathways, ecological efficiencies); food chains, food web and ecological pyramids, global biogeochemical cycles of C,N, in terrestrial and aquatic ecosystems.

Biological diversity: Concept and levels; speciation and extinction; IUCN categories of threat; distribution and global patterns, hot spots; endemism, inventory.

Air, water and soil pollution: Kinds, sources, effects on plants and ecosystems.

Climate change: Green house gases (CO₂, CH₄, N₂O, CFCs: sources, trends and role); ozone layer and ozone depletion ; consequences of climate change (CO₂ fertilization, global warming, sea level rise, UV radiation).

Biogeographical zones of India, Flora of Telangana – vegetational types.

VII Cell Biology

Ultrastructure and functions of cell organelles. Cell wall, Plasma membrane Plasmodesmata, Chloroplast, Mitochondria, Plant Vacuoles, Nucleus, Ribosomes,

Cell cycle and apoptosis : Control mechanisms; role of cyclins and cyclin dependent kinases; retinoblastoma and E2F proteins; cytokinesis and cell plate formation; mechanisms of programmed cell death. Mitosis and meiosis its significance

Other cellular organelles: Structure and functions of microbodies, Golgi apparatus, lysosomes, endoplasmic reticulum.

VIII Cytogenetics

Chromatin organization : Chromosome structure and Packaging of DNA, molecular organization of centromere and telomere; nucleolus and ribosomal RNA genes ; euchromatin and heterochromatin ; karyotype analysis ; banding patterns ; specialized types of chromosomes ; polytene, lampbrush, B chromosomes and sex chromosomes ; molecular basis of chromosome pairing.

Structural and numerical alterations in chromosomes : Duplication, deficiency, inversion and translocation ; autopolyploids ; allopolyploids ; evolution of major crop plants.

Genetics of prokaryotes and eukaryotic organelles : genetic recombination in phage ; genetic transformation, conjugation and transduction in bacteria ; genetics of mitochondria and chloroplasts cytoplasmic male sterility.

Gene structure and expression : Genetic fine structure ; cis – trans test ; Benzer's experiment; introns and their significance ; RNA splicing ; regulation of gene expression in prokaryotes and eukaryotes.

Mutations : Spontaneous and induced mutations ; physical and chemical mutagens ; molecular basis of gene mutations ; transposable elements in prokaryotes and eukaryotes ; mutations induced transposons; site-directed mutagenesis ; DNA damage and repair mechanisms.

Plant Breeding : Principles and methods of plant breeding ; Marker assisted breeding.

IX Plant Physiology

Fundamentals of enzymology : General aspects, allosteric mechanism, regulatory and active sites, isoenzymes, kinetics of enzymatic catalysis, Michaelis – Menton equation and its significance.

Membrane transport and translocation of water and solutes : Plant water relations, mechanism of water transport through xylem, passive and active solute transport, membrane transport proteins.

Photochemistry and photosynthesis : Photosynthetic pigments and light harvesting complexes, photo oxidation of water, mechanisms of electron and proton transport, carbon assimilation – the Calvin cycle, photorespiration and its significance, the C4 cycle, the CAM pathway, biosynthesis of starch and sucrose.

Respiration and lipid metabolism : Glycolysis, the TCA cycle, electron transport and ATP synthesis, pentose phosphate pathway, glyoxylate cycle, alternative oxidase system, structure and function of lipids, fatty acid biosynthesis, synthesis of membrane lipids, structural lipids and storage lipids and their catabolism.

Nitrogen fixation and metabolism : Biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation.

Photobiology : Photochromes and cryptochromes, photophysiology of light – induce responses, cellular localization.

Plant growth regulators and elicitors : Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonic acid and salicylic acid.

The flowering process : Photoperiodism, endogenous clock and its regulation, floral induction and development – genetic and molecular analysis, role of vernalization.

X Biotechnology and Genetic Engineering

Plant Biotechnology – Principles, scope and applications.

Plant cell and tissue culture : General introduction, scope, cellular differentiation, and totipotency.

Organogenesis and adventitious embryogenesis : Morphogenesis; somatic embryogenesis. Somatic hybridization : Protoplast isolation, fusion and culture.

Applications of plant tissue culture : Clonal propagation, artificial seed, production of hybrids and soma clones, production of secondary metabolites / natural products, cryopreservation and germplasm storage.

Recombinant DNA technology : Gene cloning principles and techniques, genomic / c DNA libraries, vectors, DNA synthesis and sequencing, polymerase chain reaction, DNA fingerprinting and DNA markers.

Genetic engineering of plants : Transgenic plants, Methods of gene transfer – Agrobacterium – mediated and microprojectile, chloroplast transformation, intellectual property rights, ecological risks and ethical concerns.

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Paper - II: Zoology

I **General Concepts:**

1. Levels of structural organization: Unicellular, Multi cellular and Colonial forms, Prokaryotic and Eukaryotic cells, Levels of organization of Tissues, Organs & Systems.
2. Acoelomata, Pseudocoelomata, Coelomata, Proterostomia and Deuterostomia.
3. Concepts of species and Hierarchical taxa, Biological nomenclature, Classical methods of taxonomy of animals.

II **Non-Chordata:**

1. General characters and classification of invertebrates up to class level.
2. Protozoa - Locomotion, Nutrition and Reproduction in Protozoa, Protozoan diseases of man – Amoebiasis, Malaria, Trypanosomiasis.
3. Porifera - Canal system in Porifera, Skeleton in Porifera, Reproduction in sponges.
4. Coelenterata - Polymorphism, Metagenesis, Coral formation, Obelia.
5. Helminthes - Common Helminthic parasites of Man –Fasciola hepatica, Schistosoma, Taenia solium, Echinococcus granulosus, Ascaris, Ancylostoma, Trichinella – their life cycles, Pathogenecity and clinical significance. Parasitic adaptations in Helminths.
6. Annelida - Excretory system in Annelida, Coelom formation. Coelom and coelomoducts, Metamerism.
7. Arthropoda - Mouthparts of insects, Ommatidium, Useful and harmful insects, Metamorphosis in insects, Apiculture and Sericulture in India, Crustacean larvae, Peripatus.
8. Mollusca - Torsion and Detorsion, Pearl formation.
9. Echinodermata - Echinoderm larvae, Water vascular system.

III **Chordata:**

1. General characters and classification of chordates up to class level, Origin of chordates, Phylogeny and Affinities of Hemichordata, Retrogressive metamorphosis.
2. Vertebrate integument and its derivatives, Comparative account of Digestive, Respiratory, Circulatory, Excretory and Reproductive systems of vertebrates.
3. Pisciculture in India, Common edible fishes.
4. Origin and evolution of Amphibia, Neoteny or Paedogenesis.
5. Important snakes of India, Identification of Poisonous and non- Poisonous Snakes, Poisonous Apparatus, Dinosaurs.
6. Flight adaptations and Migration in birds. Archeopteryx, Poultry.
7. Adaptive radiation in Mammals, Dentition in Mammals.

IV **Cell Biology:**

1. Prokaryotic and Eukaryotic cell, Plasma membrane-Ultra structure & function.
2. Structure and function of intracellular organelles- Mitochondria, Golgi bodies, Lysosomes, Endoplasmic reticulum, Peroxisomes, Vacuoles, Nucleus.
3. Chromosomes structure & function; Heterochromatin, Euchromatin.
4. Cell division – Mitosis and meiosis, Cell cycle & its regulation.
5. Recombinant DNA technology, Transgenesis & Cloning.
6. Protein synthesis – Genetic code, Initiation, Elongation and Termination.
7. Regulation of gene expression – Lac operon.

V **Genetics:**

1. Mendel's law of inheritance.
2. Gene mapping methods - Linkage-complete and Incomplete linkage, Linkage maps, Recombination, Mapping with molecular markers, somatic cell hybrids.
3. Crossing over - Types (Somatic or Mitotic crossing over and Germinal or Meiotic crossing over).
4. Mutations - Types (Spontaneous and Induced), Causes and detection.
5. Chromosomal aberrations (Deletion, Duplication, Inversion and Translocation, Ploidy and their genetic implications); Autosomal abnormalities (Down's syndrome, Trisomy-13, 18); Sex anomalies (Turner's syndrome, Klinefelter's syndrome, Hermaphroditism).
6. Human genetics - Human karyotyping, Genetic disorders due to mutant genes (Huntington's chorea), Sickle-cell anaemia (SCA), Inborn errors of metabolism- Phenylketonuria, Alkaptonuria .

VI System and Cell physiology:

1. Blood and circulation - Blood corpuscles, Haemopoiesis, Plasma function, Blood groups, Haemoglobin, Haemostasis.
2. Cardiovascular system - Neurogenic, Myogenic heart, Cardiac cycle.
3. Respiratory system - Transport of gases, Exchange of gases.
4. Nervous system - Neuron, Conduction of nerve impulse, Synaptic transmission, Neurotransmitters.
5. Muscle - Ultra structure of skeletal muscle, Mechanism of muscle contraction.
6. Sense organs - Eye and Ear.
7. Excretory system - Structure & function of mammalian Kidney and Nephron, Micturition.
8. Osmoregulation - Osmoregulation in Aquatic & Terrestrial animals.
9. Digestive system - Digestion, absorption, assimilation and egestion.
10. Endocrinology and Reproduction - Endocrine glands, Types of hormones & Mechanism of hormonal action, Hormonal regulation of reproduction in mammals.
11. Outline classification of organic compounds (Carbohydrates, Proteins and Lipids).
12. Glycolysis (EMP), Krebs's cycle (TCA CYCLE), Electron transport system (Oxidative phosphorylation), Pentose phosphate pathway, Gluconeogenesis.

VII Evolution:

1. Origin of life - Theories and Evidences of organic evolution, The modern synthetic theory.
2. Population genetics - (Gene pool, Gene frequency), Hardy-Weinberg's law.
3. Isolation and speciation.
4. Evolution of Man.
5. Zoogeographical realms of the world.

VIII Developmental Biology:

1. Spermatogenesis and Oogenesis.
2. Fertilization, Cleavage, Gastrulation, Formation of germ layers, Parthenogenesis.
3. Formation and Function of Foetal membranes.
4. Types of placenta.
5. Development of Frog and Chick.

IX Histology:

1. Histology of mammalian tissues and organs - Epithelial, connective, blood, bone, cartilage, skin, stomach, intestine, liver, pancreas, kidney, testis and ovary.

X Ecology:

1. Concepts of Ecosystem.

2. Biogeochemical cycles (Carbon, Nitrogen and Phosphorous).
3. Influence of environmental factors on animals, Energy flow in Ecosystem, Food chains, Food web and Tropic levels.
4. Animal Associations (Neutralism, Mutualism, Symbiosis, Commensalism, Parasitism, Predation and Competition).
5. Ecological succession.
6. Environmental pollution- Air, water, land, noise, radioactive, thermal, Effects of pollution on ecosystem, Prevention of pollution.
7. Wildlife in India- Conservation, Chipco movement.
8. Biodiversity- Economic significance, Conservation, Hot spots of India.

XI Immunology:

1. Cells of the immune system- Lymphoid cells, Mono nuclear cells, Granulocytic cells, Mast cells.
2. Organs of the immune system- Primary and Secondary lymphoid organs, Lymphatic system.
3. Antigens- Antigenic determinants or Epitopes, Immunogenicity, Haptens.
4. Humoral immunity - Immunoglobulin (Fine structure of immunoglobulin and Immunoglobulin classes).
5. Innate (Non-specific immunity) – Anatomical barriers, Phagocytosis, Natural killer cells (NK cells), Interferons.
6. Cell mediated immunity – Mechanism of cell mediated immunity.

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Paper – II: History

I Ancient India:

1. Definition of History, Scope, Nature, Sources.
2. Pre and Proto History – Stone ages and Chalcolithic Cultures.
3. Harappan Civilization – Characteristic features, Major cities – Socio-Economic conditions, Harappan Script, Religious practices –Decline.
4. Iron Age –Aryan Migrations – Second Urbanization.
5. India in 6th Century BC; Early States, Sixteen Mahajanapadas, Rise and Growth of Magadha – Society, Economy – Jainism, Buddhism, Ajivikas and Lokayatas.
6. Mouryan Age: Chandragupta Mourya and Ashoka, Mouryan Polity, Administration, Dhamma, Socio-Economic conditions – Decline.
7. Satavahana Age; Political History, Administration, Society, Economy and Culture.
8. Gupta Age: Political History, Administration, Socio-Economic conditions, Growth of Culture, Arts and Architecture, Literature – Decline.
9. India in the Seventh Century A.D.; Pushyabhutis (Harsha), Pallavas, Chalukyas and Rashtrakutas – Political History, Society, Economy and Culture.

II Medieval India:

10. India between 650 A.D. to 1200 A.D.- Rajputs, Arab and Turkish Invasions - Later Pallavas, Chalukya, Chola Art, Architecture and Chola Administration – Society, Economy and Culture.
11. Age of Delhi Sultanate 1206 A.D. -1526 A.D. – Political History, Administration, Changes in Society and Economy- Bhakti and Sufi Movements.
12. Age of Vijayanagara - Origin, Political History, Krishnadevaraya, Socio-Economic Conditions, Culture, Art, Architecture, Decline – Bahamanis.
13. Moghul Age (1526-1707) – Political History, Shershah, Akbar, Administration, Society, Economy, Culture- Decline – Marathas, Shivaji.

III. Modern India

14. Establishment of British Power in India –Early Resistance – Hyder Ali, Tippu Sultan.
15. British paramountcy in India-Policies of Governor Generals, Impact of British Policy on Indian Agriculture and Economy.
16. Socio – Religious Reforms Movements –Brahmo Samaj –Arya Samaj, Satyashodhak Samaj and others.
17. 1857 Revolt; causes, results and significance.
18. Rise and Growth of Indian National Movement –Nationalist Movement I Phase from 1885 A.D. -1905 A.D. – Indian National Congress; Moderates, Extremists and Early Revolutionaries II phase at 1905-1920 – Vande Mataram Movement Home Rule - Role of Tilak and Anie Beasant- Later phase of Revolutionary Movement. III Phase 1920-1947 -Non Co-operation Movement, Emergence of Gandhi, Civil Disobedience, Salt Satyagraha, Quit India Movement- Subhash Chandra Bose – Constitutional Reforms- Dr.B.R.Ambedkar - Declaration of Independence – Role of Women in Indian National Movement.

IV Modern World:

19. Industrial Revolution- Significance and Results.
20. American War of Independence – Causes, Results, Significance.
21. French Revolution – Causes, Effects, Significance
22. National Liberation Movements in Italy and Germany in the 19th Century – Mazzini, Cavour, Garibaldi, Bismarck.
23. World War-I – Causes and Effects – League of Nations.
24. The Russian Revolution of 1917 – Causes, Results and Significance.

25. The world between the Two World Wars – Nazism in Germany, Fascism in Italy, Turkey under Mustafa Kamal Pasha.
26. Developments in China 1911-1949 – Nationalist Revolution of 1911 – Communist Revolution of 1948.
27. World War-II – Causes and Effects – United Nations Organisation.

V History of Telangana

28. Pre History
29. Pre-Satavahana, Satavahana, Post-Satavahana - Ikshvakus, Vakatakas, Abiras and Vishnukundis.
30. Telangana from 7th Century to 11th Century- Chalukyas of Badami, Vemulavada, Mudigonda and Kalyana.
31. Age of Kakatiya's; Origin, Political History, Administration, Socio Economic, Religious conditions, Art and Architecture and Literature and their Subordinates.
32. Padma Nayaka's and Musunoori.
33. Qutubshahis – Administration, Religion, Art, Architecture and Literature.
34. Asafjahis – Administration, Economy, Culture and Society, British Paramountcy on Hyderabad State. Freedom Movement in Telangana, Telangana Armed Struggle.

Main Examination Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Paper – II: Economics

I. Micro Economics

1. Demand Analysis

Definitions, Nature and Scope of Economics – Micro and Macro Economic Analyses – Concepts of Demand and Law of Demand – Determinants and Types of Demand – Demand Function – Concepts of Supply and Law of Supply – Market Equilibrium – Elasticity of Demand : Concept and Types – Measurement Methods of Price Elasticity of Demand

2. Utility Analysis

Cardinal and Ordinal Utility Approaches – Law of Diminishing Marginal Utility – Law of Equi-Marginal Utility – Consumer Surplus – Indifference Curve Analysis: Consumer's Equilibrium – Derivation of Demand Curve with the help of Indifference Curves – Price, Income and Substitution Effects – Revealed Preference Theory

3. Production Analysis

Production, Production Function and Factors of Production – Law of Variable Proportions – Isoquant, Isocost Curves and Producer's Equilibrium – Laws of Returns to Scale – Economies of Scale – Cost Analysis: Cost Curves in Short Run and Long Run – Revenue Analysis – Relationship among Average Revenue, Marginal Revenue and Elasticity of Demand

4. Market Structure Analysis

Concepts of Firm, Industry and Market – Classification of Markets – Objectives of the Firm – Equilibrium of a Firm – Shut-Down Point – Perfect Competition: Concept, Characteristics, Equilibrium of Firm and Industry – Optimum Firm – Monopoly: Concept, Types, Characteristics and Equilibrium of the Firm – Price Discrimination – Monopolistic Competition: Concept, Characteristics and Equilibrium of the Firm

5. Oligopoly, Duopoly and Factor Pricing Analysis

Oligopoly: Concept, Characteristics and Price Rigidity – Kinky Demand Curve – Duopoly: Concept and Characteristics – Cournot Model – Marginal Productivity Theory of Distribution – Distribution Theories of Rent, Wages, Profit and Interest

II. Macro Economics

1. National Income Analysis

Concept, Nature & Scope and Importance of Macro Economics – Concept of Circular Flow of Incomes – National Income Analysis: Concepts and Components – Methods of Measurement of National Income – Importance of and Difficulties in the Estimation of National Income – Limitations of National Income as a Measure of Welfare

2. Theories of Income and Employment

Classical Theory of Employment: Say's Law of Markets and Pigou's Wage Cut Policy – Keynesian Theory of Income and Employment: Effective Demand, Aggregate Demand Function and Aggregate Supply Function – Consumption Function – Factors Determining Consumption Function – Savings Function – Concepts of Multiplier, Accelerator and Super-Multiplier

3. Theories of Investment and Interest Rate

Capital and Investment – Types and Determinants of Investment – Marginal Efficiency of Capital – Classical, Neo-Classical and Keynesian Theories of Interest – Simultaneous Determination of Interest and Real Income through IS-LM Framework

4. Supply of Money and Demand for Money

Meaning, Functions and Classification of Money – Meaning and Measures of Money Supply – Demand for Money – Classical Theories of Money: Fisher's and Cambridge Versions of Quantity Theory of Money – Keynesian and Milton Friedman Approaches to Demand for Money

5. Inflation and Trade Cycles

Inflation: Concept, Types, Causes and Measurements – Effects of Inflation – Measures to Control Inflation – Phillips Curve, Deflation and Stagflation – Trade Cycles: Concept, Nature and Causes – Phases and Remedial Measures of Trade Cycles

III. Public Finance

1. Introduction to Public Finance

Role of State in Economic Activities, Planning and Development – Nature, Scope and Evolution of Public Finance – Public, Private and Merit Goods – Multiple Theory of Public Household – Principle of Maximum Social Advantage

2. Public Revenue and Taxation

Public Revenue: Sources and Classification – Direct and Indirect Taxes – Progressive, Proportional and Regressive Taxes – Canons of Taxation – Characteristics of a Good Tax System – Impact and Incidence of Taxation – Effects of Taxation

3. Public Expenditure and Public Debt

Public Expenditure: Classification and Principles – Determinants of Public Expenditure – Theories of Public Expenditure: Wagner and Peacock-Wiseman – Effects of Public Expenditure – Public Debt: Nature, Sources and Classification – Effects and Redemption of Public Debt – Debt Trap

4. Fiscal Policy and Federal Finance

Fiscal Policy: Concept, Objectives and Tools – Fiscal Policy and Monetary Policy – Federal Finance: Concept and Features – Centre-State Financial Relations – Transfer of Resources from Centre to State and Local Bodies – Functions of Finance Commission – Current Finance Commission's Recommendations

5. Budget

Budget: Concepts, Classification and Types – Revenue Account and Capital Account – Budget Deficits: Concepts, Types and Implications – Fiscal Responsibility and Budget Management (FRBM) – Budgeting in India

IV. International Economics

1. Theories of International Trade

International Trade, Inter-Regional Trade and Inter-Industry Trade – Gains from Trade – Trade as an Engine of Economic Growth – Role of International Trade in Economic Development – Classical and Neo-Classical Theories of International Trade – Heckscher-Ohlin Theory of International Trade

2. Terms of Trade and Barriers to Trade

Concepts of Terms of Trade – Factors Affecting Terms of Trade – Uses and Limitations of Terms of Trade – Secular Deterioration Hypothesis of Terms of Trade: Singer and Prebisch – Tariffs, Quotas and Subsidies: Their Effects – Impact of Tariffs on Partial and General Equilibrium Analyses – Political Economy of Non-Tariff Barriers and Their Implications

3. Balance of Payments

Concepts of Balance of Trade and Balance of Payments – Factors Affecting Balance of Trade – Differences Between Balance of Trade and Balance of Payments – Components of Balance of Payments – Equilibrium and Disequilibrium in Balance of Payments – Types of Disequilibrium – Causes and Consequences of Disequilibrium in Balance of Payments – Remedial Measures for Correcting Disequilibrium in Balance of Payments – Recent Trends in India's Balance of Payments

4. Exchange Rates

Foreign Exchange Market – Exchange Rates: Concept and Types – Relative Merits and Demerits of Fixed and Flexible Exchange Rates – Theories of Exchange Rates Determination: Mint Parity and Purchasing Power Parity (PPP) – An Overview of Different Methods of Exchange Rate Determination in India

5. International Monetary System and International Finance

Lending Operations of International Financial Institutions: IMF, World Bank (IBRD), IDA, IFC, ADB and BRICS – Euro-Dollar and Euro-Currency Markets – International Trade Institutions: GATT and WTO – Impact of WTO on Indian Economy

V. Economics of Development and Growth

1. Socio-Economic and Institutional Aspects of Economic Development

Concepts of Economic Growth, Development and Underdevelopment – Distinction Between Growth and Development – Objectives of Economic Development – Sustainable Development and Inclusive Growth – Indicators of Economic Development

2. Factors of Economic Development

Factors Hindering Economic Development – Factors Promoting Economic Development – Population and Economic Development – Population Explosion – Theories of Demographic Transition – Malthusian Population Theory – Optimum Theory of Population – Natural Resources and Economic Development

3. Theories of Growth and Development

Classical Theories of Economic Growth: Adam Smith, Ricardo and J. S. Mill – Karl Marx Theory of Economic Development – Schumpeter's Theory of Economic Development – Rostow's Theory of Economic Growth

4. Strategies of Economic Development and Growth

Big Push Theory – Balanced Growth Strategies of Rodan, Nurkse and Lewis – Unbalanced Growth Strategy of Hirschman – Critical Minimum Effort Thesis – Low Level Equilibrium Trap – Theories of Social and Technological Dualism

5. Growth Models Harrod-Domar Growth Model – Kaldor's Growth Model – Joan Robinson's Growth Model – Gunnar Myrdal's Model – Choice of Techniques: AK Sen – Technical Progress: Hick and Harrod

VI. Indian Economy

1. Basic Structure and Demographic Features of Indian Economy

Basic Features of Indian Economy: Growth, Trends and Structural Changes in Indian Economy – Demographic Features of Indian Population – Size, Growth and Composition of Population and Their Implications on Indian Economy – Sectoral and Occupational Distribution of Population in India – Population Policy of India – Human Resource Development: Education and Health – Human Development Index

2. National Income, Income Inequalities, Poverty and Unemployment

Estimation of National Income in India – Trends and Composition of National Income in India – Income Inequalities in India: Magnitude, Causes, Consequences and Remedial Measures – Poverty in India: Concept, Types, Trends, Causes and Consequences – Unemployment in India: Concept, Types, Trends, Causes and Consequences – Poverty Alleviation and Employment Generation Programmes in India

3. Planning and Public Policy

Concept, Types and Importance of Planning – Major Objectives of Five Year Plans in India – Review of Five Year Plans : Achievements and Failures – Current Five Year Plan – NITI Aayog – Economic Reforms: Liberalisation, Privatisation and Globalisation – A Critical Evaluation of Economic Reforms – Regional Imbalances – Rural-Urban Disparities: Migration

4. Agricultural Sector

Nature and Importance of Agriculture in Indian Economic Development – Trends in Agricultural Production and Productivity – Agricultural System in India and

Land Reforms – Green Revolution – Cropping Pattern – Agricultural Finance and Rural Indebtedness – Agricultural Marketing – Agricultural

Pricing – Food Security in India

5. Industrial and Service Sectors

Structure, Growth, Trends and Importance of Indian Industry – Problems of Indian Industry – Medium, Small Scale and Micro Enterprises (MSME) : Growth, Role and Problems (Including Sickness Problem) – Industrial Policies of 1948 and 1991 – FEMA and Competition Commission of India – Disinvestment Policy – Foreign Direct Investment – Concept and Components of Service Sector – Infrastructural Development: Transport, Energy, Communication and Information and Technology

VII. Telangana Economy

1. Telangana Economy: Human Resources

Economic History of Telangana – Economic Features of Telangana – Demographic Features of Telangana – Occupational Distribution of Population in Telangana – Sectoral Distribution of Population – Human Resource Development: Education and Health

2. Gross State Domestic Product, Poverty and Unemployment

Growth and Trends in Gross State Domestic Product and Per Capita Income in Telangana: District wise Analysis – Sectoral Contribution to Gross State Domestic Product – Inequalities in the Distribution of Income and Wealth – Poverty in Telangana: Trends, Causes and Consequences – Unemployment in Telangana: Trends, Causes and Consequences – Poverty Alleviation and Employment Generation Programmes in Telangana – Other Welfare Programmes in Telangana State

3. Agricultural Sector

Growth of Agriculture in Telangana Economy – Trends in Agricultural Production and Productivity – Determinants of Agricultural Productivity – Cropping Pattern – Agrarian Structure and Land Reforms – Irrigation: Sources and Trends – Mission Kakatiya – Agricultural Credit and Rural Indebtedness –Agricultural Marketing

4. Industrial Sector

Structure of Telangana Industry – Growth and Pattern of Industrial Development in Telangana – Industrial Policy of Telangana State – Special Economic Zones (SEZ) – Role of Small Scale Industries in Telangana Economy – Problems & Remedial Measures of Small Scale Industries: Issue of Sickness – Industrial Finance in Telangana

5. Service and Infrastructural Sectors

Growth and Trends in Tertiary Sector in Telangana – Growth and Pattern of Development of Service Sector in Telangana – Infrastructural Development in Telangana: Transport, Energy, Communications, Information Technology and Tourism

VIII. Quantitative Methods for Economic Analysis

1. Mathematical Foundations of Economic Analysis

Need and Importance of Quantitative Methods in Economics – Meaning and Basic Concepts of Mathematics: Constants and Variables – Functions: Linear, Non-Linear Functions – Equations and Graphs of Linear, Quadratic and Cubic Functions – Concept of Derivative – Rules of Differentiation with respect to Cost, Revenue, Price and Demand Functions –Application of Maxima and Minima in Economic Analysis

2. Introduction to Statistics

Meaning, Basic Concepts and Uses of Statistics – Population and Sample – Frequency Distribution, Cumulative Frequency – Graphic and Diagrammatic Representation of Data – Types of Data: Primary and Secondary Data – Methods of Data Collection: Census and Sampling Methods (Random and Non-Random Sampling Methods)

3. Measures of Central Tendency and Dispersion

Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean – Properties of Good Average – Comparison of Different Averages – Measures of Dispersion – Absolute and Relative Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation and Variance

4. Correlation and Regression

Correlation: Meaning and Types – Karl Pearson's Correlation Co-efficient – Spearman's Rank Correlation – Regression: Meaning and Uses of Regression – Estimation and Interpretation of Regression Line

5. Index Numbers and Time Series Analysis

Index Numbers: Meaning and Uses – Types of Index Numbers – Methods of Index Numbers: Laspeyres, Paasche and Fisher – Analysis of Time-Series: Meaning and Uses – Components of Time Series Analysis: Secular, Seasonal, Cyclical and Irregular Variations – Methods of Measurement of Secular Trends: Graphic, Semi-Averages, Moving Averages and Least Squares Methods

IX. Banking and Economics of Infrastructure

1. Commercial and Central Banking

Commercial Banks: Concept and Types – Functions and Principles of Commercial Banks – Balance Sheet of Commercial Banks – Process of Credit Creation – Social Responsibility, Importance and Growth of Commercial Banks in India – Central Banking – Functions of Reserve Bank of India – Concept and Objectives of the Monetary Policy – Instruments of Monetary Policy – Financial Sector Reforms in India

2. Financial and Investment Banking

Concept, Types, Functions and Growth of Non-Banking Financial Intermediaries – Their Impact on Indian Economy – Measures Taken to Control Their Operations – Development Bank: Concept, Functions and Importance – Functioning of Different Development Banks – Investment Banking – Merchant Banking

3. Money Market and Capital Market (Financial Markets)

Money Market: Concept and Characteristics – Components and Sub-Markets of Money Market – Functions of Money Market – Recent Trends and Importance of Money Market in India – Capital Market: Concept, Functions and Importance – Components of Capital Market: Primary and Secondary Markets – Stock Exchange: Concept and Functions – SEBI and Its Functions

4. Infrastructure and Economic Development

Concept of Infrastructure – Infrastructure as a Public Good – Special Characteristics of Public Utilities – Importance of Infrastructure in Economic Development – Trends in the Growth of Infrastructure in India – Classification of Infrastructure: Social and Physical Infrastructure – Social Infrastructure: Education, Health and Hygiene – Human Resource Development: Concept, Scope and Importance – Education in India: Planning, Policies and Financing – Trends in the Growth of Education in India – Health in India: Planning, Programmes and Importance

5. Physical Infrastructure

Types of Physical Infrastructure – Concept of Energy – Sources of Energy: Renewable & Non-Renewable and Conventional & Non-Conventional Energy – Sources of Commercial Energy: Coal, Oil & Gas and Electric Power – Transport – Modes / Categories of Transport: Roadways, Railways, Airways and Waterways – Role of Transportation in Economic Development – Information and Communication Technology (ICT): Concept, Growth, Trends and Importance

X. Economics of Environment

1. Introduction to Environmental Economics

Concepts of Ecology and Environment – Interaction Among Ecology, Environment and Economy – Micro Economic Theory of Environment – The

Pricing of the Environmental Variables – Pareto Optimality and Market Failure in the Presence of Externalities – Bio-Diversity: Meaning, Uses, Effects and Conservation

2. Resource Allocation

Natural Resources: Meaning, Features, Classification and Importance – Economics of Exhaustible, Non-Exhaustible Resources – Problems of Resource Allocation – Natural Resources Depletion: Optimal Rate of Depletion – Common Property Resources: Problems – Conservation of Resources – Implications of Ecological Imbalances

3. Environmental Valuation

Valuation of Non-Market Goods and Services: Measurement Methods – Environmental Degradation: Concept and Causes – Valuation of Environmental Degradation – Direct and Indirect Methods – Degradation of Land (Soil), Forest and Natural Resources: Causes and Effects – Cost-Benefit Analysis of Environmental Policies and Regulations

4. Sustainable Development

Impact of Environment on GNP – Limits to Growth – Sustainable Development: Concept and Rules – Modern and Neo-Classical Views on Sustainable Development – Peoples Movement for Sustainable Development – Development vs Sustainable Development

5. Environmental Pollution and Policies

Environment and Economy Interaction – Industrial and Agricultural Technology: Its Impact on Environment – Different Types of Pollution: Their Causes and Effects – Environmental Policy and Conservation and Protection of Eco-System – Implementation of Environmental Policies in India – Global Environmental Issues.

Main Examination Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Paper – II: Civics

I. Public Policy

- a) Introduction to Public Policy : Nature, Scope and Importance of Public Policy, Public Policy as a Policy Science
- b) Theories: Systems, Structural-Functional, Incremental, Elite, Group Theory
- c) Public Policy Making: Role of Legislature, Executive, Judiciary, Bureaucracy, Political Parties, Pressure Groups, Mass Media
- d) Policy Impact and Policy Evaluation: Land Reforms, Irrigation, Education, Health, Food Security and Social Security Policies

II. Research Methodology

- a) Social Science Research : Importance and Objectivity in Social Science Research – Scientific Method
- b) Research Methods – Historical, Analytical, Descriptive, Exploratory, Case Study Method
- c) Research Design : Selection of Research Problem and Hypotheses
- d) Data Collection : Primary and Secondary Sources
- e) Data Analysis, Interpretation and Report Writing

III. Public Administration

- a) Introduction : Meaning, Nature, Scope and Importance of Public Administration
- b) Evolution of Public Administration : Classical, Human Relations, Behavioural, Ecological, Socio-Psychological Approach, New Public Management
- c) Principles of Organisation – Hierarchy, Span of Control, Unity of Command, Centralisation Decentralisation – Bases of Departmental Organisation – Line Agencies and Staff Agencies, Leadership
- d) Union Government : Parliament, President, Prime Minister, Council of Ministers, Cabinet, Cabinet Secretariat, Prime Minister's Office (PMO)
- e) State Government : State Legislature, Governor, Chief Minister and Council of Ministers, Secretariat and Directorates
- f) District Administration : District Collector, Special Agencies – District Rural Development Agency, Integrated Tribal Development Agency
- g) Local Government: Rural - Panchayati Raj Institutions – Gram Panchayat, Mandal Parishad, Zilla Parishad. Urban - Municipal Corporation, Municipalities, Urban Development Authorities, District Planning Committee
- h) Constitutional Bodies : Comptroller & Auditor General, Finance Commission, Election Commission, Commissions for SC, ST, BCs, Women and Minorities

IV. Political Science

- (a) Introduction : Definition, Meaning, Nature, Scope and Importance of Political Science
- (b) State : Essential Elements – Sovereignty and Theories of Sovereignty : Monistic and Pluralistic Theories of Sovereignty - Theories of Origins of State : Divine Origin, Social Contract, Historical and Evolutionary – Sphere of State Activity : Laissez Faire, Anarchist, Fascist, Socialist, Marxist, Welfare State
- (c) Basic concepts : Law, Liberty, Equality, Rights and Justice
- (d) Governments : Classification of Governments – Traditional and Modern
- Forms Governments : Unitary, Federal, Presidential and Parliamentary
- (e) Democracy: Direct Democracy and Indirect Democracy – Direct Democratic Devices
- (f) Theory of Separation of Powers – Legislature, Executive and Judiciary and their functions
- (g) Social and Political Movements : Separate Telangana Statehood Movement - Dalit and Tribal Movements, Women's Movement and Environmental Struggles

V. India's Foreign Policy: Determinants and Features, Non-Alignment and U.N.O.

Main Examination Syllabus for the post of Junior Lecturer in Residential Educational Institution Societies

Paper- II: Commerce

- I. Financial Management: Meaning, Nature, Objectives and Scope of Financial Management – Capital Budgeting, Process, Techniques – Sources of Finance, Cost of Capital – Cost of various sources of finance –
Leverages: Operating and Financial leverages - Capital Structure Theories – Dividend decisions – Working Capital Management – Cash, Receivables and Inventory Management.
- II. Financial and Management Accounting: Accounting concepts and conventions – GAAP – Indian Accounting Standards - Accounting process- Final Accounts (Sole Trade, Partnership and Company) – Depreciation Accounting – Accounts from Incomplete Records – Accounts of Non-Trading Organisations - Analysis of Financial Statements – Techniques: Comparative and Common Size statements, Trend analysis, Ratio analysis, Funds Flow and Cash Flow analysis – Marginal Costing and Decision Making.
- III. Cost Accounting and Control: Cost concepts and Classification – Installation of costing system – Elements of Cost: Material, Labour and Overheads – Methods of Costing – Techniques of costing: CVP, Standard Costing and Budgetary control – Uniform costing, Inter-firm comparisons and Activity Based costing – Cost Control, Cost Reduction and Cost Audit.
- IV. Managerial Economics: Meaning, Nature and Scope of Managerial Economics – Demand Analysis, Production and Cost Analysis- Market Structure: Perfect and Imperfect Markets.
- V. Organisation Theory and Behaviour: Organisation concept and theories – Individual vs. Group Behaviour –Motivation and Morale – Communication: Types and Barriers – Leadership: Styles and Theories.
- VI. Marketing Management: Meaning, Concepts, Nature and Scope – Marketing Environment – Consumer Behaviour and Market Segmentation – Product, Price, Promotion and Channel management.
- VII. Quantitative Techniques: Measures of Central Tendency – Measurers of Variation – Measurers of Skewness - Correlation and Regression Analysis – Time Series Analysis – Index Numbers - Sampling and Sampling methods.