

संस्कृत साहित्य

(Code No. GKV - 11)

Note :

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इकाई - १ वेद एवं निरुक्त

- (क) ऋग्वेद- अग्निसूक्त १/१, पुरुषसूक्त १०/६०, नासदीयसूक्त १०/१२, इन्द्रसूक्त २/१२, विष्णुसूक्त १/५४, यजुर्वेद- ४०वाँ अध्याय, अथर्ववेद- पृथ्वीसूक्त १-२० मन्त्र।
(ख) निरुक्त १-२ अध्याय।

इकाई - २ वैदिकसाहित्य का इतिहास

वेदोत्पत्ति, वेदनित्यत्व, वेदों का प्रतिपाद्य विषय, वेदों के प्रमुख भाष्यकार, वेदांगों का संक्षिप्त परिचय तथा उपनिषदों का परिचय।

इकाई - ३ संस्कृत काव्य तथा नाटक

नैषधीयचरितम्- प्रथमसर्ग, मेघदूतम्, उत्तररामचरितम्, मुद्राराक्षसनाटकम्, रत्नावलीनाटिका, कादम्बरीकथामुखपर्यन्तम्, नलचम्पू प्रथमोच्छ्वास एवं संस्कृतसाहित्य का सामान्य परिचय।

इकाई - ४ काव्यशास्त्र

काव्यप्रकाश- १,२,८,९,१० उल्लास, ध्वन्यालोक- प्रथमोद्घोत, दशरूपकम्, काव्यशास्त्र के इतिहास का सामान्य परिचय।

इकाई - ५ व्याकरण

- (क) कारक, सन्धि, समास, एवं कृत प्रत्यय।
(ख) व्याकरणमहाभाष्यम्- प्रथम आह्निक, वाक्यपदीयम्- प्रथमकाण्डम्
(ग) व्याकरणशास्त्र के इतिहास का सामान्य परिचय।

इकाई - ६ भाषाविज्ञान

भाषाविज्ञान का स्वरूप, भाषा का प्रादुर्भाव तथा विकास, भाषाओं का वर्गीकरण- आकृतिमूलक-वंशमूलक, अर्थपरिवर्तन के नियम, भाषा परिवर्तन के कारण, वर्णोच्चारण के शरीरावयव।

इकाई - ७ दर्शनशास्त्र

सांख्यकारिका, तर्कभाषा-प्रमाण विवेचन, वेदान्तसार।

इकाई - ८ दर्शनशास्त्र का इतिहास

भारतीय आस्तिक एवं नास्तिक दर्शनों का सामान्य परिचय।

इकाई - ९ अनुवाद

हिन्दी से संस्कृत में अनुवाद।

इकाई - १० अपठित संस्कृत गद्य पद्यों का हिन्दी में अनुवाद।

वैदिक साहित्य

(Code No. GKV-12)

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- इकाई-१ ऋग्वेद**
ऋग्वेद के निम्न सूक्तों का अध्ययन-
१/१ (अग्निसूक्त), (१/११५ (सूर्यसूक्त), १०/९० (पुरुषसूक्त), १०/१२९ (नासदीय सूक्त), १०/१५१ (श्रद्धासूक्त)।
- इकाई-२ यजुर्वेद (वाजसनेयी माध्यन्दिन)**
(क) निम्न अध्यायों का अध्ययन-३२, ३६ एवं ४०।
(ख) ऋग्वेदादिभाष्यभूमिका (स्वामी दयानन्द) के निम्न विषय
(१) वर्णाश्रम-व्यवस्था।
(२) पञ्चमहायज्ञ विषय।
- इकाई-३ सामवेद**
सामवेद संहिता के निम्न मन्त्रों का आध्यात्मिक अध्ययन
(क) (१) आग्नेयपर्व के प्रारम्भिक १० मन्त्र
(२) ऐन्द्र पर्व के प्रारम्भिक ०५ मन्त्र।
(३) पवमान पर्व के प्रारम्भिक ०५ मन्त्र।
(ख) सामगानों का संक्षिप्त परिचय।
- इकाई-४ अथर्ववेद**
(क) अथर्ववेद (शौनक) के निम्न सूक्तों का अध्ययन
१/१ (वाचस्पति), १/३४ (मधुविद्या), ३/१५ (वाणिज्य), ३/३० (सौमनस्य)।
(ख) ऋग्वेदादिभाष्यभूमिका (स्वामी दयानन्द) के निम्न प्रकरणों का अध्ययन
(१) वेदोत्पत्ति, (२) वेद सञ्ज्ञा, (३) उपासना, (४) पुनर्जन्म।
- इकाई-५ निरुक्त (यास्क)**
(क) निरुक्त प्रथम और द्वितीय अध्याय।
(ख) वर्णोच्चारण शिक्षा (स्वामी दयानन्द)।
(ग) ऋग्वेदादिभाष्यभूमिका (स्वामी दयानन्द) का वैदिक व्याकरण प्रकरण।
- इकाई-६ कर्मकाण्ड**
१. स्वामी दयानन्द प्रणीत संस्कार विधि सम्पूर्ण।
- इकाई-७ वैदिक साहित्य का इतिहास**
वेद, ब्राह्मण, आरण्यक, उपनिषद् एवं वेदाङ्ग साहित्य का सामान्य परिचय।
- इकाई-८ उपनिषद् वाङ्मय**
निम्न उपनिषदों का अध्ययन
१. ईशावास्योपनिषद् (सम्पूर्ण)।
२. केनोपनिषद् (सम्पूर्ण)।

इकाई-९

३. कठोपनिषद् (सम्पूर्ण)।

भारतीय दर्शन

निम्न ग्रन्थों का अध्ययन

१. सांख्यकारिका-आचार्य ईश्वरकृष्ण (सम्पूर्ण)।

२. श्रीमद्भगवद्गीता का द्वितीय अध्याय।

३. अष्टाङ्गयोग का सामान्य परिचय।

४. षड्दर्शनों का सामान्य परिचय।

इकाई-१०

लौकिक संस्कृत

(क) संस्कृत साहित्य का सामान्य परिचय-वाल्मीकि, व्यास, कालिदास, भवभूति, बाणभट्ट, मम्मट।

(ख) काव्यप्रकाश-आचार्य मम्मट-प्रथमोल्लास सम्पूर्ण।

(ग) हिन्दी से संस्कृत एवं संस्कृत से हिन्दी में अनुवाद।

PHILOSOPHY

(Code No. GKV-13)

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इकाई-१

अवैदिक दर्शन

चार्वाक-भौतिकवाद, प्रत्यक्ष सिद्धान्त, अनुमान का खण्डन, चार पदार्थ;

जैन- स्याद्वाद, सप्तमङ्गीनय, अनेकान्तवाद, द्रव्यः, अस्तिकाय, अनस्तिकाय, जीव, अजीव, त्रि-रत्न।

बौद्ध - प्रत्यक्ष, अनुमान, प्रमाण-व्यवस्था, प्रतीत्यसमुत्पाद, अनात्मवाद, क्षणिकवाद, शून्यवाद, त्रि-रत्न (शील, समाधि, प्रज्ञा), निर्वाण।

UNIT- I

Vedic Philosophy

Charvak's Materialism, Theory of Perception, Refutation of Inference, Four categories,

Jaina's Theory of Syadvad, Saptabhangi Naya, Anekantvad, Substance: Astikāya, Anastikāya, Jiva, Ajiva, Tri-Ratna.

Buddhists' Perception, Inference, Pramān-vyavastha, Dependent origination, No-soul-Theory, Momentariness, Sunyavad, Tri-Ratna (Sheel, Samadhi, Prajñā), Nirvān.

इकाई-२

न्याय-वैशेषिक दर्शन

ज्ञान, ज्ञान स्रोत, परतः प्रामाण्य, वस्तुवाद, प्रमाण-सम्प्लव, कार्य-कारण सिद्धान्त, ईश्वर के अस्तित्व में प्रमाण, न्याय-पदार्थ, वैशेषिक पदार्थ, परमाणु-सिद्धान्त, बन्धन, मोक्षा।

UNIT- II

Nyaya-Vaisheshika

Knowledge: Source of knowledge, Paratah-Pramāṇya, Vastuvad, Pramān-samplav, Theory of causation Realism, Proofs for the existence of God, Nyaya's categories, vaisheshika's-categories, Theory of Atoms. Bondage, Liberation.

इकाई-३

सांख्य-योग

पुरुष एवं प्रकृति, अतिस्त्व के प्रमाण, पुरुष-प्रकृति सम्बन्ध, सृष्टि-क्रम, पुरुष का बहुत्व, ज्ञान का स्वतः प्रामाण्य; योग की परिभाषा, योग की विषयवस्तु, चित्त, चित्त की भूमियाँ, चित्त की वृत्तियाँ, योग के आठ अंग, ईश्वर।

UNIT-III

Sankhaya -Yoga

Purusha and Prakriti, Proofs for their existence, Three-gunas, Their relation, Evolution of the world, Plurality of the Purusha, Satkāryavāda, Svatah-prāmāṇya.

The subject matter : Definition of Yoga, Chitta, it's stages and vritties, Eight limbs of Yoga, God.

इकाई-४

पूर्व-मीमांसा-वेदान्त

शब्द, शब्दबोध, शब्द-प्रकृति शक्तियाँ (अभिधा, व्यजना, लक्षणा), संकेतग्रह (व्यक्तिवाद, जातिवाद, आस्रति, व्यक्ति-जाति-आस्रति), स्रोत-सिद्धान्त।

आत्मा, ज्ञान का स्वभाव, धर्म तथा धर्म-लक्षण, भावना।

ब्रह्म, ईश्वर, जीव, जगत्, माया, अविद्या, अध्यास, विवर्तवाद, ज्ञान, कर्म, उपासना, अद्वैत, विशिष्टाद्वैत, शरणागति।

UNIT- IV

Purva-Mimansa-Vedanta

Shabdabodha, Theories of Meaning, Nature of Shabda (Abidha, vyanjana, laksana), Referent of a word (Vyaktivada, Jativada, Akritivada, Vyakti-Jati-Akritivāda, The theory of sphota.

The soul, the nature of knowledge, Dharma and it's characteristics, Bhavana, Brahma, Ishwar, Jiva, Jagat, Maya, Avidya, Adhyasa, Vivartavād, Jnana, karma, upāsanā, Advaita, Vishishtadvaita, Anubhava-vakya, Shara?āgati.

इकाई-५	<p>तर्कशास्त्र</p> <p>तर्कशास्त्र की परिभाषा, तर्कशास्त्र का क्षेत्र, आगमन, निगमन, तार्किक प्रतीक, सत्य-सारणियाँ, तादात्म्य का नियम, व्याघात नियम, मध्य परिहार का नियम, कान्टेरी तथा सब-कान्टेरी प्रतिज्ञप्तियाँ, व्याप्ति, पंचावयव, हेत्वाभास।</p>
UNIT-V	<p>Logic</p> <p>Definition of Logic, Scope of Logic, Induction, Deduction, Law of Identity, Law of Contradiction, Law of excluded middle, syllogism, (Panchavayava) Logical symbols, Truth - Tables, Yyapti, Hetvabhasa, (Fallacies of inference), Contrary propositions, Sub-contrary proposition.</p>
इकाई-६	<p>भारतीय एवं पाश्चात्य नीतिशास्त्र</p> <p>नीतिशास्त्र का स्वभाव तथा क्षेत्र, शुभ-अशुभ, पुरुषार्थ-चतुष्टय, वर्णाश्रम धर्म, प्रवृत्ति एवं निवृत्ति मार्ग, ज्ञानयोग, भक्ति-योग, कर्म-योग; चार आर्य सत्य, त्रि-रत्न, अहिंसा, सत्य, सत्याग्रह।</p> <p>पाश्चात्य नीतिशास्त्र का स्वभाव, क्षेत्र, नैतिक-निर्णय, सुखवाद, उपयोगितावाद, शुभ, शुभ की परिभाषा, प्रास्रतिक हेत्वाभास, संकल्प की स्वतंत्रता, कैटेगरीकल इम्परेटिव, दण्ड के सिद्धान्त, नैतिकता, उचित-अनुचित, काण्ट प्रदत्त नैतिक-सूत्र।</p>
UNIT-VI	<p>Indian & Western Ethics</p> <p>Nature and scope of Indian Ethics, Shubha, Ashubha, Purusartha- Chatustaya, Varanashramdharmas, Sthitaprajnata, The ways of Pravitti and Nivritti, Jnana, Bhakti and Karma Yoga in Gita, Four noble truths, Jainas; 'Tri-Ratna.</p> <p>Nature and scope of Western ethics, Moral Judgement, Hedonism, Utalitarianism, Good and it's definition, Naturalistic Fallacy, Freedom of Will, Theories of Punishment, Morality, Right & Wrong, Maxims of Morality (Kant).</p>
इकाई-७	<p>यूनानी एवं आधुनिक पाश्चात्य दर्शन</p> <p>मौलिक समस्याएँ : सुकरात एवं उनकी पद्धति, प्लैटो तथा उनका ज्ञान-सिद्धान्त, अरस्तू एवं उनका ज्ञान-सिद्धान्त, अगस्टाइन का ज्ञान-सिद्धान्त।</p> <p>बुद्धिवाद : देकार्त, स्पिनोजा, लाइबनिट्स;</p> <p>अनुभववाद : लाँक, बर्कले, ह्यूम;</p> <p>समीक्षावाद : काण्ट।</p> <p>निरपेक्षप्रत्ययवाद : हीगेल</p>
UNIT-VII	<p>Greek & Modern Western Philosophy</p> <p>Fundamental Problems : Socrates and his method, Plato and his theory of knowledge, Aristotle and his Metaphysics, Augustine's theory of knowledge.</p> <p>Rationalism : Descartes, Spinoza, Leibnitz</p> <p>Empiricism : Locke, berkeley, Hume.</p> <p>Critical Philosophy : Immanuel Kant.</p> <p>Absolutism : Hegel</p>
इकाई-८	<p>समकालीन पाश्चात्य दर्शन</p> <p>हुसरल का आभास (फिनामिनोलोजिकल) सिद्धान्त : अनुभवातीत आत्मा, अस्तित्ववाद : कीर्किगार्ड, नीत्शे, हाईडेगर, सार्ड जास्पर्स। ब्रैडले का आभास एवं सत् : सत् के सिद्धान्त। अर्थक्रियावाद: विलियम जेम्स, पियर्स, तार्किक भाववाद, वर्ग-संघर्ष।</p>
UNIT-VIII	<p>Contemporary Western Philosophy</p> <p>Husserl's Phenomenological Method, Transcendental soul, Existentialism : Kierkegaard, Nietzsche, Heidegger, Sartre, Jasspers, Bradley's, appearance and Reality, Theories of truth, Pragmatism : William James, Peirce, Logical Positivism; Class-struggle, Language-game of wittgenstein.</p>
इकाई-९	<p>समकालीन भारतीय दर्शन</p> <p>स्वा० दयानन्द दर्शन : वैदिक दर्शन, ज्ञानमीमांसा, ईश्वर, जीव, प्रस्रति, मायावाद का खण्डन, श्री अरविन्द का</p>

	अतिमानस विचार, पुनर्जन्म परमतत्त्व एवं दिव्य आत्मा। स्वामी विवेकानन्द का व्यावहारिक वेदान्त, रवीन्द्रनाथ टैगोर का ईश्वर एवं धार्मिक अनुभूति, महात्मा गांधी-सत्य, अहिंसा, सत्याग्रह, साध्य-साधन- सिद्धान्त, रामराज्य
UNIT-IX	Contemporary Indian Philosophy Philosophy of Swami Dayananda : Vaidik Philosophy, Epistemology, Ishwar, Jiva and Prakriti, Refutation of Mayavada, Aurobindo's concept of Atimanas, Rebirth, Supreme Reality, Divine Soul, The practical vedanta of Sri Vivekananda, The concept of ishwar, religious experience, Rabindranath, Mahatma Gandhi's theory of Truth, Ahinsa, Ramarajya, End and Means. Satyagraha.
इकाई-१०	सामाजिक एवं राजनैतिक दर्शन व्यक्ति, परिवार, समाज, राज्य, राष्ट्र, अधिकार एवं कर्तव्य, स्वतन्त्रता, समानता, न्याय, लोकतंत्र, निरंकुशता, साम्यवाद, वैश्वीकरण, वैदिक समाजवाद, मृत्यु-दण्ड, मृत्यु का अधिकार, लिंग-असमानता।
UNIT- X	Social & Political Philosophy Individual, Family, Society, State, Nation, Rights and Duties, Democracy, Freedom, Equality, Justice, Dictatorship, Communism, Globalization, Vaidika Socialism, Punishment of Death, Right to die, Foeticide.

ENGLISH

(Code No. GKV-14)

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UNIT- I Literary Critical Theory: Main features and major exponents/works

- 1. New Criticism
- 2. Stylistics
- 3. Structuralism
- 4. Deconstruction
- 5. Discourse Analysis
- 6. Feminism
- 7. Post-Colonialism
- 8. Protest literature

UNIT-II Indian Critical Theories: Main features and major exponents/works

- 1. Rasa Theory
- 2. Alankar Theory
- 3. Riti Theory
- 4. Dhvani Theory
- 5. Vakrokti Theory
- 6. Auchitya Theory
- 7. Function of Kavya
- 8. Word Power

UNIT-III Study of Language

- 1. Speech Mechanism
- 2. Vowels
- 3. Consonants
- 4. Varieties of Language: Dialects, Register etc.
- 5. Free and Bound Morphemes
- 6. Affixation
- 7. Compounding, blending, acronym, clipping
- 8. ELT

UNIT-IV Indian English Literature

- 1. Toru Dutt, Tagore, Sri Aurbindo, Sarojini Naidu
- 2. Ezekiel, A.K.Ramanujan, Kamala Das, Parthasarthy
- 3. Mulk Raj Anand, Raja Rao, R.K.Narayan, Bhabani Bhattacharya, Manohar Malgonkar
- 4. Anita Desai, Arun Joshi, Nayantara Sahgal, Shashi Deshpande, Shobha De, Amitabh Ghosh
- 5. Asif Currimbhoy, Girish Karnad, Mahesh Dattani, Vijay Tendulkar
- 6. Gandhi, Nehru, Nirad C. Chaudhury
- 7. Prem Chand, Mohan Rakesh, Mannu Bhandari
- 8. Indian Autobiographies and biographies in English

UNIT-V

- 1. British Drama
- 2. Classical and Romantic Dramas
- 3. University Wits
- 4. Shakespeare
- 5. Jacobean Drama
- 6. Restoration Drama
- 7. Comedy of Ideas
- 8. Poetic Drama
- 9. Absurd Drama

UNIT-VI British Poetry

- 1. Chaucer
- 2. Elizabethan Lyrics and Sonnets
- 3. Metaphysical Poetry

-
4. Neo Classical Poetry
 5. Romantic Poetry
 6. Victorian Poetry
 7. Modernist Poetry
 8. Post Modernist Poetry
- UNIT-VII**
British Fiction
1. Four Wheels of English Novel
 2. Early 19th Century Women Novelists
 3. Victorian Novelists
 4. Early 20th Century Novelists
 5. English Novelists of Post 1950s.
- UNIT-VIII**
English Prose
1. Bacon
 2. Addison and Steele
 3. Charles Lamb
 4. Hazlitt, Carlyle, Ruskin
 5. Chesterton, A.G.Gardiner, Robert Lynd
- UNIT-IX**
Diasporic Literature
1. V.S.Naipaul
 2. Salman Rushdie
 3. Bharati Mukharjee
 4. Vikram Seth
 5. Rohinton Mishtri
 6. Uma Parmeshwaran
 7. Himani Banerjee
- UNIT-X**
Post Colonial Literature
1. Chinua Achebe
 2. Wole Soyinka
 3. Nadine Gordimer
 4. I.M.Koetzee
 5. Michael Ondachu
 6. Gabriel Marcia Marquez

हिन्दी साहित्य (Code No. GKV-15)

Note :

- (i) Paper setter shall set 100 questions from the syllabus and each question shall carry one mark.
(ii) Number of questions should be set equally from each unit (ten questions from each unit) of the prescribed syllabus for RET.

- इकाई -१ हिन्दी साहित्य के इतिहास की पूर्वपीठिका
हिन्दी साहित्य के इतिहास में काल विभाजन, नामकरण एवं हिन्दी साहित्य के पुर्नलेखन की समस्याएं,
हिन्दी भाषा का उद्भव एवं विकास ।
- इकाई -२ हिन्दी साहित्य के इतिहास का आदिकाल
जैन, नाथ, सिद्ध, परम्परा और प्रवृत्तियाँ, नामकरण, रासो काव्य, गद्य साहित्य, लौकिक साहित्य ।
- इकाई -३ हिन्दी साहित्य के इतिहास का भक्तिकाल
उद्भव और विकास, प्रवृत्तियाँ, विभिन्न सम्प्रदाय, कबीर, जायसी, तुलसी, सूरदास। संत काव्य-
परम्परा, सूफी काव्य-परम्परा ।
- इकाई -४ हिन्दी साहित्य के इतिहास का रीतिकाल
नामकरण, प्रवृत्तियाँ, केसव, बिहारी, भूषण, घनानन्द, आलम, बोधा, रीतिकालिन गद्य साहित्य।
- इकाई -५ हिन्दी साहित्य के इतिहास का आधुनिक काल
प्रमुख विधाएं (गद्य और पद्य) विभिन्न काल और साहित्यिक आन्दोलन, विधाएं - कहानी, उपन्यास,
नाटक, कविता, जीवनी, संस्मरण, रिपोर्ताज, डायरी, हास्य-व्यंग्य, एकांकी, आत्मकथा, नवगीत, लघुकथा।
- इकाई -६ भाषा विज्ञान
भाषा और व्याकरण, विभिन्न बोलियाँ एवं उच्चारण, शब्द, वाक्य, पद, संधि, समास, मुहावरे और लोकोक्तियाँ।
- इकाई -७ भारतीय काव्यशास्त्र
काव्य की परिभाषा, काव्य लक्षण, काव्य प्रयोजन, काव्य दोष, रस, अलंकार, शब्द-शक्ति, विभिन्न
भारतीय आलोचक, समालोचना के सिद्धांत।
- इकाई -८ पाश्चात्य काव्य शास्त्र
साहित्य में विभिन्न वाद - मार्क्सवाद, समाजवाद, मनोविश्लेषणवाद, आस्तित्ववादी दर्शन, बिम्बवाद,
अभिव्यंजनावाद, त्रासदी, विरेचन, विखण्डनवाद।
- इकाई -९ हिन्दी पत्रकारिता
उद्भव और विकास, पत्रकारिता के प्रकार, आवधिक संरचना, काल विभाजन।
- इकाई -१० प्रयोजन मूलक हिन्दी
राजभाषा एवं राष्ट्रभाषा, पत्र लेखन, पल्लवन, संक्षेपण, टिप्पण, पारिभाषिक शब्दावली, कम्प्यूटर
परिचय, इंटरनेट, जन संचार के माध्यम, अनुवाद।

HUMAN CONSCIOUSNESS & YOGIC SCIENCE

(Code No. GKV-16)

Note :

- (i) Paper setter shall set 100 questions from the syllabus and each question shall carry one mark.
- (ii) Number of questions should be set equally from each unit (ten questions from each unit) of the prescribed syllabus for RET.

UNIT - I Fundamental of Yogic Science

Origin & definitions of yoga. Scope of yoga, Personality of a yogi - its characteristics. Nature of yoga in Upnishads, Gita, Yoga Vashistha, Saddarshan & Ayurveda. Types of yoga - Rajyoga, Bhakti Yoga, Jnan Yoga, Karma Yoga, Astangyoga. Life Sketch & their contributions in the field of yoga Patanjali, Yajnavalkya, Gorakshnath, Swami Dayanand, Swami Vivekananda, Swami Kuvalayananda.

UNIT - II Yoga Sutra

Historical and compositional knowledge of Patanjali Yoga Sutras, Concept of Yoga; Chitta- its Bhumis and Vrittis, methods of Vritti control; Samadhi- concept and its types, God- its concept and need. Yogantrayas; Kriya Yoga, Principle of Karma, Astang Yoga, Panch Kleshas, Sanyama, Occult powers, Prakriti, Purusha & Kaivalya.

UNIT - III Principles of Hathyoga

Hathyoga- concept, definition, Proper place, time, season for Hathyogic practices, elements of success and failure in Hath yoga, Sign & symptoms of success in Hath yoga, Scope of Hath yoga in modern times. Basic knowledge of Hath yoga texts. Knowledge of Asanas, Shatkarmas, Pranayama, Mudra & Bandha, Pratyahara, Meditation & Samadhi as described in Hath pradipika & Gherand Samhita; Nadanusandhan, Kundalini- its form & means of awakening, Nadis, Chakras & Koshas- their basic knowledge.

UNIT - IV Samkhya & Geeta

- (A) Three types of miseries in accordance with Samkhya, means to overcoming them, origin of 25 elements, Satkaryavada, form of Gunas, Purusha, Prakriti. Eight major functions of Buddhi, Thirteen causative factors, eight occult powers, liberation.
- (B) Geeta- Soul, Law of Karma, form of religion & Samnyas, means to achieve Brahm-Jnan, Abhyasa & Vairagya, Meditation, Elusion & Concept of God.

UNIT - V Human Anatomy & Physiology

- (A) Basic knowledge of anatomical & physiological aspects of human skeletal, muscular, digestive, respiratory, cardio-vascular, excretory, endocrinal, sense organs & nervous systems and the effects of yogic practices on them. Place, form & functions of mind. Tridoshas, Dhatus & Malas- place their salient features & functions.
- (B) Various Yogic practices described in Hathpradipicka & Gherand Samhita viz. Satkarma, Asanas, Pranayama, Mudras & Bandhas, Meditation etc. - their theoretical & practical aspects.

UNIT - VI Human Consciousness

Consciousness- its meaning, concept, definition & its form. Need of study for Human consciousness, Present problems and their means of eradication, Consciousness in Vedas, Upnishads, Philosophy, Tantra, Astrology & Ayurveda. Consciousness in Western world and principle of Quantam, Consciousness - its attitude in modern psychology, different mysteries of Consciousness - birth & life & luck, purusarth, fruits of Karma, Sanskar & rebirth. Various methods of development of Human consciousness.

UNIT - VII Yoga & Health

Health- its concept & aims, Swasthvat Vigyan- meaning & aims, Yoga & Ayurveda based daily regime, night regime, seasonal regime, Sadvrat and Achar Rasayan. Diet- its concept, definition, types, Balanced diet and its components, quantity, timing, Rules & regulations of diet based upon Hathyoga & Swara Yoga, Indicated and contraindicated dietary articles for a yoga practitioner.

UNIT - VIII Naturopathy

Naturopathy- its concept, history & basic principles. Principles, technique & benefits of Mud therapy, water therapy, Air therapy, Diet therapy, Sun rays therapy, fasting therapy, Massage therapy.

UNIT - IX Yogic & Alternative therapies

- (A) Concept of Health & disease, Principles of Yogic therapy causes, sign & symptoms and yogic treatment of skeletal, digestive, respiratory cardio-vascular, endocrinal, nervous system & mental disorders, sense organs related problems.
- (B) Alternative therapy - its concept, aims & objectives, types- Acupressure, Pranic healing, Magneto

UNIT - X

therapy, Swarayogic therapy.

Research Methodology

- (A) Nature of Research, Scientific approach & methods, Importance of Research methods in yoga. Problems- meaning & nature, nature & statement of Hypothesis. Sampling - meaning & method. Research methods - Observation Technique, correlation Techniques, Experimental method. Control nature, Dependent & Independent variables; experimental research method- Experimental designs, Research Designs. (Two randomized groups designs & factorial designs.)
- (B) Statistics Meaning & Importance of statistics, Frequency distribution, Measures of Central tendency, mean, median & mode, Standard deviation, Correlation method, Chi-Square Test, Regression method, significant of mean, t-test, Anova.

प्राचीन भारतीय इतिहास, संस्कृति एवं पुरातत्व

(Code No. GKV-17)

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- UNIT - I** (i) प्राचीन भारतीय इतिहास : अध्ययन स्रोत- साहित्यिक एवं पुरातात्विक
(ii) प्रागैतिहासिक काल - पूर्वपाषाण काल, मध्यपाषाण काल, नवपाषाण काल एवं ताम्रपाषाण काल।
- UNIT - II** हड़प्पा संस्कृति - उत्पत्ति एवं विस्तार, तिथिक्रम, नगर योजना, राजनीतिक संगठन, सामाजिक एवं आर्थिक जीवन, धार्मिक विश्वास, पतन।
- UNIT - III** वैदिक एवं उत्तर-वैदिक काल - वैदिक साहित्य, आर्यों का मूल निवास स्थान, राजनैतिक संगठन, सामाजिक एवं आर्थिक जीवन, धार्मिक तथा दार्शनिक विचार, अनुष्ठान एवं पद्धतियाँ।
- UNIT - IV** महाजनपद काल - महाजनपद एवं गणराज्य तथा उनकी राजनीतिक स्थिति, मगध साम्राज्य का उत्कर्ष (हर्षक वंश से नन्द वंश तक) एवं राजनीतिक प्रणाली, व्यापारिक मार्गों का विकास, विनिमय एवं मुद्रा, श्रेणी संगठनों का उदय, समाज व्यवस्था।
- UNIT - V** धार्मिक क्रान्ति एवं विदेशी आक्रमण- जैन एवं बौद्ध धर्म की उत्पत्ति एवं विस्तार तथा आजीवक सम्प्रदाय, ईरानी एवं यूनानी आक्रमण तथा उनके प्रभाव।
- UNIT - VI** मौर्य साम्राज्य - मौर्य साम्राज्य की स्थापना, चन्द्रगुप्त मौर्य, अशोक का धम्म, प्रशासन, मौर्य साम्राज्य का विघटन, समाज एवं अर्थव्यवस्था, अभिलेख एवं मुद्रा, कौटिल्य अर्थशास्त्र एवं मेगस्थनीज इण्डिका, कला एवं वास्तुकला।
- UNIT - VII** मौर्योत्तर काल - शुंग, कण्व, शक, कुषाण एवं पश्चिमी क्षत्रपो का उत्थान एवं पतन, प्रशासन, धर्म, समाज, अर्थव्यवस्था, श्रेणी संगठन, ब्राह्म देशों से सम्पर्क, आन्तरिक एवं विदेशी मार्ग, अभिलेख एवं मुद्रा, कला एवं वास्तुकला, साहित्य एवं विज्ञान।
- UNIT - VIII** खारवेल, सातवाहन, संगमयुग के तमिल राज्य - साहित्य, प्रशासन, समाज, धर्म, अर्थव्यवस्था, व्यापार एवं वाणिज्य, व्यापारिक संघ।
- UNIT - IX** वाकाटक, गुप्त वंश एवं वर्धन वंश - प्रशासन, आर्थिक स्थिति, विनिमय एवं मुद्रा, श्रेणी संगठन, ब्राह्म देशों से सम्पर्क, भूमिदान की प्रथा, अभिलेख, भारतीय सामन्तवाद, जातिप्रथा, दास प्रथा, स्त्रियों की स्थिति, शिक्षा एवं शैक्षणिक संस्थाएँ - नालन्दा, विक्रमशिला, वल्लभी, साहित्य एवं विज्ञान, कला एवं वास्तुकला।
- UNIT - X** राजपूत काल - राजपूतों की उत्पत्ति, प्रारम्भिक चालुक्य, पाल, गुर्जर-प्रतिहार, गुजरात के चालुक्य, चन्देल, परमार, राष्ट्रकूट, पल्लव, चोल, कलचुरि, गहड़वाल एवं चाहमानी का संक्षिप्त इतिहास, प्रशासन, सामन्तवाद, समाज, अस्पृश्यता, स्त्रियों की स्थिति, कला एवं साहित्य, अरब एवं तुर्क आक्रमण।

PSYCHOLOGY

(Code No. GKV-18)

Note :

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UNIT-I Research Methodology & Statistics

Research: meaning and significance, Hypothesis: statement and types, Research Strategies and techniques: observation method, experimental method, questionnaire and interview, Variables: meaning and types, manipulation of dependent and independent variables. Central tendencies, Correlation, Regression, ANOVA, t-test, F-test.

UNIT-II Cognitive Processes

Perception: depth perception, pattern recognition, perceptual constancy, brightness, size and shape. Learning: classical and instrumental conditioning, reinforcement schedule. Motivation: arousal, drive reduction theory, learned helplessness, Memory: short term memory, semantic memory, network models, forgetting. Thinking and problem solving: reasoning, deductive and inductive language comprehension and production, problem solving, classification of problems.

UNIT-III Personality

Personality and its measurement method, process of personality development. Self in Indian thoughts: vedic, yoga, triguna, tridosha, vipasyana approaches. Psychoanalytic approaches: structure, development and dynamics of Freud, Jung and Adler's theory. Self Approaches: Murray, Maslow, Roger. Trait Approaches: Allport, Cattell, Eysenck.

UNIT-IV Social Psychology

Socialization: meaning, agents, stages of socialization, determinants of socialization. Attitude: development and component of attitude formation, attitude change. Culture and personality: relationship between culture and personality, effect of culture on personality. Social problems: poverty, deprivation, population growth, gender issues, social violence, modernization.

UNIT-V Psychological Testing

Psychological testing: its application.
Norms: developmental norms, within group norms, standard scores, C scores. Reliability and validity: types and methods. Item analysis: item difficulty, item discrimination. Projective techniques: pictorial techniques, inkblot techniques, verbal technique, performing techniques.

UNIT-VI Health Psychology

Stress: types of stressors: physiological stressors and psychological stressors, positive role of stress, models of stress. Prevention and management of stress, environmental psychology, relaxation and Bio-feedback, meditation and yoga. Disease prevention: drug and alcohol abuses, unsafe sexual behaviour, smoking, diet, sedentary life style. Deduction of unhealthy behaviour, stress personality and social support as psycho-social linkage of ill health: cardiovascular disorders, AIDS, HIV, Diabetes, Pain, Cancer.

UNIT-VII Psychopathology

Neurotic and Psychotic disorders. Psychopathology of adolescence : Juvenile delinquency, learning disability. Adolescent stress. Psychopathology of childhood: anxiety, phobia (school phobia), thumb sucking, Developmental disorder: mental handicap, autism, Cerebral palsy. Therapeutic approaches: Freudian, cognitive and client centered approaches. Depression and child behavioral problems.

UNIT-VIII Organization Behaviour

Group Dynamics and Teams - Theories of Group Formation - Formal Organization and Informal Groups and their interaction - Importance of teams - Formation of teams - Team Work.
Organizational Climate - Organizational Culture - Organizational Effectiveness Leadership - Definition-Importance - Leadership Styles - Models and Theories of Leadership Styles.
Management of Change - Importance - Forces responsible for change - Resistance to change - Overcoming resistance to change Introduction of change in the organization - Organizational Development as a tool for introduction of change.
Conflict Management - Traditional vis-a-vis Modern view of conflict - Constructive and Destructive conflict - Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructive conflict.

UNIT-IX

Clinical & Community Interventions

Skills of a therapist, therapeutic interventions. Principles and models of crisis intervention, mental health models, ecological model, social action model. Criminal behaviour: psycho-social genesis, therapeutic intervention. Rehabilitation of old age persons. Anger management. Suicide ideation: causes and remedies. Community crimes.

UNIT-X

Counseling Psychology

Counseling: purpose, goals, professional issues and ethics. Counseling process: external condition and preparation. Counseling relationship: counseling interview. Counseling application: child counseling, family counseling, Career counseling, alcohol and drug abuses, crisis intervention counseling. Counseling evaluation.

MANAGEMENT

(Code No. GKV-19)

Note :

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- (ii) Number of questions should be set equally from each unit (ten questions from each unit) of the prescribed syllabus for RET.

UNIT-I Fundamentals of Management

Theory of Karma Siddhanta, Scientific Management, Leadership: an Indian vision, Functions of Management, Management levels, Objectives, Policy & Strategy, Organization structure, Authority & Responsibility, Organizational design, Centralization and Decentralization, Leadership Styles and behaviour, Control Process, types of control.

UNIT-II Economics and Quantitative Analysis

Economics: Marginal Analysis, Optimization techniques, theory of Demand, Production and Cost, Returns to Scale, Cost Curves and Break-Even Analysis, Profit and Sales Maximization, Organizational Slack, Market Structure, GDP, WPI, CPI and Inflation. Balance of Payments, Money Supply, Monetary Policy, Fiscal Policy, National Income, Consumption Function, Quantitative Analysis: Frequency Distribution, Probability Distributions-Binomial, Poisson, Normal & Exponential. Correlation and regression, Test of Hypothesis, Analysis of Variance, Time Series.

UNIT-III Finance & Accounting

GAAP, Preparation of Financial Statements: Profit and Loss account, Balance Sheet, Cost accounting, Reconciliation of cost and financial accounts, Marginal and Absorption Costing, Standard Costing and Variance Analysis. Financial analysis: financial Statement Analysis, Ratio analysis, Fund flow analysis, Cash flow analysis, International accounting standards. Capital Budgeting, Cost of Capital, Leverages & Capital Structure, Working Capital Management: Inventory Management, CVP analysis and Dividend policy Cost Volume Profits Analysis.

UNIT-IV Organizational Behaviour

Concepts of organizational behaviour: Attitudes, Personality, Perception, Learning Group behaviour and Group Dynamics. Transactional Analysis, Quality circles, Confrontation session, Sensitivity Analysis, Managerial Grid and Controlling, Communication, Types of Communication, Quality Circle, Work force diversity.

UNIT-V Human Resource Management

Job analysis, Recruitment and Selection, Training and Development, Performance Appraisal, Potential Evaluation, Job Evaluation & Wage Determination, Employee Welfare, Industrial Relations, Dispute Resolution & Grievance Management, Conflicts, Disputes, Collective Bargaining, Quality of Work Life, HRD Mechanism, Training and Development Factories Act: 1948, Payment of Wages Act 1936, Industrial Dispute Act 1947, Workmen's Compensation Act 1923, ILO.

UNIT-VI Marketing Management

Market segmentation, Product Decisions, Pricing methods, Promotion decisions, Place decisions Consumerism, Green marketing, Rural marketing, e-marketing, retailing, Advertising, Personal Selling, Designing Services Strategy, Marketing of Financial Services.

UNIT-VII Research Methodology

Types of Research, research process, Research Problem, Hypothesis, Testing of hypotheses, Research Design, Sampling Data Collection, Scaling techniques, Processing and Analysis of Data, Report writing.

UNIT-VIII Project Management

Tools and Techniques for Project Management, Project Feasibility, Cost Estimates, Finalization of Project Implementation Schedule, Project Profitability, Appointing a Project Manager, Organizing Systems and Procedures for project Implementation: Simon's Model of Decision-Making, Decision Support system, DSS, Database Management System (DBMS).

UNIT-IX Corporate Strategy

Process of strategic management, Company Mission, Corporate Governance M.E. Porter's Five Forces Model, Industry analysis, organization analysis, Generic strategies, strategy evaluation, strategic choice, implementing strategy, Designing organizational structure, Designing strategic control systems.

UNIT-X International Business

Foreign Exchange Risk Coverage, Foreign Exchange Regulations, International Monetary System, Balance of Payments, International Financial Institution, India's Foreign Trade, Major export commodities, Export Credit & guarantee corporation. GATT, WTO, UNCTAD, NAFTA, ASEAN.

PHYSICS

(Code No. GKV-20)

Note :

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UNIT-I Mathematical Physics

Linear algebra, matrices, Cayley Hamilton theorem, eigenvalue problems; Linear differential equations; Special functions (Hermite, Bessel, Laguerre and Legendre); Fourier series, Fourier and Laplace transforms; Elements of complex analysis: Laurent series-poles, residues and evaluation of integrals; Elementary ideas about tensors; Elements of computational techniques: roots of functions, interpolation, extrapolation, integration by trapezoidal and Simpson's rules, solution of first order differential equations using Runge-Kutta method; Finite difference methods.

UNIT-II Classical Mechanics

Variational principle, Lagrangian and Hamiltonian formalisms and equations of motion; Poisson brackets and canonical transformations; Symmetry, invariance and conservation laws, cyclic coordinates; Central-force motion; Two-body collisions, scattering in laboratory and centre-of-mass frames; Rigid body dynamics, moment of inertia tensor; Periodic motion, small oscillations and normal modes; Special theory of relativity, Lorentz transformations, relativistic kinematics and mass-energy equivalence.

UNIT-III Electromagnetic Theory

Electrostatics: Gauss' 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 fields at interfaces; Scalar and vector potentials; Gauge invariance; Electromagnetic waves in free space, dielectrics, and conductors; Reflection and refraction, polarization, Fresnel's Law; Dispersion relations in plasma; Transmission lines and wave guides; Dynamics of charged particles in static and uniform electromagnetic fields; Radiation from moving charges, dipoles and retarded potentials.

UNIT-IV Quantum Mechanics

Wave-particle duality; Wave functions in coordinate and momentum representations; Commutators and Heisenberg's uncertainty principle; Matrix representation; Dirac's bra and ket notation; Schroedinger equation (time-dependent and time-independent); Eigenvalue problems such as particle-in-a-box, harmonic oscillator, etc.; Tunneling through a barrier; Motion in a central potential; Orbital angular momentum, Angular momentum algebra, spin; Addition of angular momenta; Hydrogen atom, spin-orbit coupling, fine structure; Time-independent perturbation theory and applications; Variational method; WKB approximation; Time dependent perturbation theory and Fermi's Golden Rule; Selection rules; Semi-classical theory of radiation; Elementary theory of scattering, phase shifts, partial waves, Born approximation; Identical particles, Pauli's exclusion principle, spin-statistics connection; Relativistic quantum mechanics: Klein Gordon and Dirac equations.

UNIT-V Statistical Mechanics

Laws of thermodynamics and their consequences; Thermodynamic potentials, Maxwell relations; Chemical potential, phase equilibria; Phase space, micro- and macrostates; Microcanonical, canonical and grand-canonical ensembles and partition functions; Free Energy and connection with thermodynamic quantities; First- and second-order phase transitions; Classical and quantum statistics, ideal Fermi and Bose gases; Principle of detailed balance; Blackbody radiation and Planck's distribution law; Bose-Einstein condensation.

UNIT-VI Electronics

Semiconductor diodes, transistors, CE, CB and CC amplifiers, FET & MOSFET characteristics, Frequency effects and applications; OP-AMP theory, Negative feedback, Linear and non-linear OP-AMP circuits, Oscillators and timers, Thyristers; Digital Electronics: Logic gates, HA, FA, K-map, flip-flops, registers, counters, comparators and similar circuits, A/D and D/A converters; Microprocessor and microcontroller basics; Communication Electronics- AM & FM circuits, transmitters and receivers, Antenna.

UNIT-VII Experimental Techniques and data analysis

Data interpretation and analysis; Precision and accuracy, error analysis, propagation of errors, least

squares fitting, linear and nonlinear curve fitting, chi-square test; Transducers (temperature, pressure/vacuum, magnetic field, vibration, optical, and particle detectors), measurement and control; Signal conditioning and recovery, impedance matching, amplification (Op-amp based instrumentation amp, feedback); Hall effect, four probe and Vander-Paw methods; X-ray diffraction technique.

Applications of the above experimental and analytical techniques to typical undergraduate and graduate level laboratory experiments.

UNIT-VIII

Atomic & Molecular Physics

Quantum states of an electron in an atom; Electron spin; Stern-Gerlach experiment; Spectrum of Hydrogen, helium and alkali atoms; Relativistic corrections for energy levels of hydrogen; Hyperfine structure and isotopic shift; width of spectral lines; LS & JJ coupling; Zeeman, Paschen Back & Stark effect; X-ray spectroscopy; Electron spin resonance, Nuclear magnetic resonance, chemical shift; Rotational, vibrational, electronic, and Raman spectra of diatomic molecules; Frank – Condon principle and selection rules; Spontaneous and stimulated emission, Einstein A & B coefficients; Lasers, optical pumping, population inversion, rate equation.

UNIT-IX

Condensed Matter Physics

Bravais lattices; 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; Diamagnetism, paramagnetism, and ferromagnetism; Electron motion in a periodic potential, band theory of metals, insulators and semiconductors; Superconductivity, type – I and type - II superconductors, Josephson junctions; Defects and dislocations; Ordered phases of matter, translational and orientational order, kinds of liquid crystalline order.

UNIT-X

Nuclear and Particle Physics

Basic nuclear properties: size, shape, charge distribution, spin and parity; Binding energy, semi-empirical mass formula; Liquid drop model; Fission and fusion; Nature of the nuclear force, form of nucleon-nucleon potential; Charge-independence and charge-symmetry of nuclear forces; Isospin; Deuteron problem; Evidence of shell structure, single- particle shell model, its validity and limitations; Rotational spectra; Elementary ideas of alpha, beta and gamma decays and their selection rules; Nuclear reactions, reaction mechanisms, compound nuclei and direct reactions; Classification of fundamental forces; Elementary particles (quarks, baryons, mesons, leptons); Spin and parity assignments, isospin, strangeness; C, P, and T invariance and applications of symmetry arguments to particle reactions, parity non-conservation in weak interaction.

CHEMISTRY

(Code No. GKV-21)

Note :

- (i) Paper setter shall set 100 questions from the syllabus and each question shall carry one mark.
- (ii) Number of questions should be set equally from each unit (ten questions from each unit) of the prescribed syllabus for RET.

- UNIT- I** Coordination Chemistry: Molecular orbital theory as applied to octahedral complexes, δ - bonding in octahedral complexes; cis and trans isomerism in square planar and octahedral complexes. Term symbols S,P,D,F, in a cubic field; splitting of term for d configuration; spectra of Transition metal complexes, selection rules and intensities of the transitions, nature of Electronic transitions in complexes, Calculation of Dq , B' and \hat{a} for Cr (III) and Ni (II) complexes. Structural Evidence from Electronic spectra, charge-transfer spectra.
- UNIT- II** Bioinorganic Chemistry General introduction to Bio-inorganic Chemistry; occurrence of Inorganic elements in organisms, classification of metallo bio-molecules; Biologically important features and functions of inorganic elements, Biologically important ligands for metal ions, co-ordination by proteins and Enzymatic catalysis.
- (a) Role of metal ions (An overview) in Biological systems Na, K, Ca, Mg & Zn (Giving suitable examples) Biom mineralisation.
 - (b) Role of non-metals in Biological systems, viz; Cl, B, Si, As, Br, F, I, Se (Giving suitable examples)
- UNIT- III** Electromagnetic spectrum, Electronic band spectra (UV and Vis region), Lambert's law, Beer's law, Beer's-Lambert law, Extinction coefficient, idea of Bathochromic and Hypsochromic shifts, Hyperchromic and Hypochromic effects, Instrumentation, Simple and general applications of UV-Vis spectroscopy to organic compounds. Vibrational rotational spectra- Principle, absorption of infrared radiation & molecular vibration. Fundamental vibrations and overtones. Infrared vibration - active and forbidden (Selection rules). Instrumentation, simple and general applications of I. R. spectroscopy. Atomic Absorption spectroscopy, flame photometric methods of estimation of alkali and alkaline metals.
- UNIT-IV** NMR Spectroscopy: Basic concept, Low resolution & high resolution nmr; chemical shift, coupling constant, shielding & deshielding, Simple application of pmr. E.S.R. spectra of transition metal complexes, spin Hamiltonian, Instrumentation and application of E.S.R. and NMR spectroscopy. Mass spectroscopy: Basic idea, Principle of operation of mass spectrometer, Instrumentation, fragmentation pattern of major functional groups, simple general applications.
- UNIT- V** Treatment of Data in Quantitative Analysis: Accuracy, Precision, Standard deviation, Types of errors, Elimination of errors, Significant figures, Rejection quotient test. Polarisation, Overvoltage, Theories of Hydrogen overvoltage, Ilkovic equation, d.m.e., Half wave potential, Diffusion current, Polarography and its simple and general applications (Specific applications not required). Ion Exchange: Cation and Anion exchangers, their Stability, Selectivity and Characteristics. General applications including ion exchange chromatography.
- UNIT- VI** Theory, technique and applications of Conductometric, Potentiometric and pH- metric titrations. Solvent Extraction: Principles, Techniques and applications. Chromatographic techniques: Basic principles, experimental techniques, and simple and general applications of Column, Paper, Thin layer, Gas-solid, Gas- liquid and High-Performance Liquid Chromatography.
- UNIT- VII** Physico-chemical analysis of water samples for turbidity, conductivity, total solids, filterable, nonfilterable, fixed and volatile solids, pH, total carbonate, bicarbonate and total alkalinity, B.O.D., C.O.D., D.O., NH_3 , NO_3 , NO_2 , organic N_2 , total N_2 , Inorganic phosphates, silica, SO_4^{--} , Hardness (Ca and Mg), Na, K, residual Chlorine; Optimum alum dose. Treatment and analysis of soil samples for porous nature, water absorbing capacity, loss on ignition, pH, conductance, cation exchange capacity, chlorides, sulphates, soluble carbonates and bicarbonates, total organic matter, available phosphorus, available nitrogen, nitrogen by Kjeldahl's method, exchangeable Na and K.
- UNIT- VIII** Oils and Fats: General idea, Classification, Occurrence, Basic idea of the function of oils and fats, Physical and chemical properties of oils and fats, Applications of oils and fats. Analysis of oils and fats: Determination of physical constants like M.P. and B.P., Specific gravity, Refractive index, Total volatile matter, Determination of Acid value, Iodine value, R.M. value, Polenske number. Soaps and detergents: Idea of common soaps, Cleansing action of soaps, Varieties of soaps and their

	uses, Idea of detergents, Hazards of soaps and detergents. Analysis of soaps and detergents: Determination of Matter insoluble in alcohol, Free alkali and free acids, Matter insoluble in water, Glycerol content (Dichromate method), Foaming capacity and its comparison in different samples of soaps and detergents, Effect of sodium carbonate on the foaming capacity of soap.
UNIT- IX	Chemical Kinetics: Derivation of 3rd order kinetic equation, collision theory for uni, bi and termolecular reactions, Steric factor, Theory of absolute reaction rates, Entropy of activation. Experimental techniques for the study of kinetics of slow and fast reactions. Potential energy surfaces (two-dimensional and three-dimensional diagrams), P.E. surface for $H + H_2$ reaction, Concept of COL and Contour diagram. Opposing, Consecutive, Side and Induced reactions, Induction period. Chain reactions and explosion limits. Reactions in solution, Factors affecting the rates in solutions, effect of solvation and Internal pressures, Double and Single sphere models, Effect of ionic strength, Bronsted-Bjerrum equation.
UNIT- X	Macromolecules: Addition and condensation polymerisation. Degree of polymerisation and length of polymer chains. Requirement of purity for synthesis. Molecular weights and their distribution. Polydispersity. Determination of molecular weight by Osmotic pressure, Viscosity, light scattering and sedimentation equilibrium methods. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

MATHEMATICS

(Code No. GKV-22)

Note :

- (i) Paper setter shall set 100 questions from the syllabus and each question shall carry one mark.
- (ii) Number of questions should be set equally from each unit (ten questions from each unit) of the prescribed syllabus for RET.

UNIT – I Real Analysis

Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum, Sequence and series, convergence, limsup, liminf, Bolzano Weierstrass theorem, Heine Boral theorem, continuity, uniform continuity, differentiability, mean value theorem, sequences and series of functions, uniform convergence, Riemann sums and Riemann integral, improper integrals.

Monotonic functions, types of discontinuity, functions of bounded variation, Lebesgue measure, Lebesgue integral, functions of several variables, directional derivative, partial derivative, derivative as a linear transformation.

Metric spaces, compactness, connectedness, Normed linear spaces, spaces of continuous functions as examples.

UNIT– II Linear Algebra

Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations, algebra of matrices, rank and determinant of matrices, linear equations, eigenvalues and eigenvectors, Cayley-Hamilton theorem, matrix representation of linear transformations, change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms, inner product spaces, orthonormal basis, quadratic forms, reduction and classification of quadratic forms.

UNIT – III Complex Analysis

Algebra of complex numbers, the complex plane, polynomials, power series, transcendental functions such as exponential, trigonometric and hyperbolic functions, analytic functions, Cauchy-Riemann equations, Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, maximum modulus principle, Schwartz lemma, open mapping theorem, Taylor series, Laurent series, calculus of residues, conformal mappings, Mobius transformations.

UNIT – IV Algebra

Permutations, combinations, pigeon-hole principle, inclusion-exclusion principle, derangements, fundamental theorem of arithmetic, divisibility in \mathbb{Z} , congruences, Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutations groups,

Cayley's theorem, class equations, Sylow theorems, Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain, polynomial rings and irreducibility criteria, fields, finite fields, field extensions.

UNIT – V Differential Equations

Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs, general theory of homogenous and non-homogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Green's function.

Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs, and classification of second order linear PDEs, method of separation of variables of Laplace, heat and wave equations.

UNIT – VI Numerical Analysis

Numerical solutions of algebraic equations, method of iteration and Newton-Raphson method, rate of convergence, solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, finite differences, Lagrange, Hermite and spline interpolation, Numerical differentiation and integration, numerical solution of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods, finite differences method.

UNIT – VII Calculus of Variations and Linear Integral Equations

Variation of a functional, Euler-Lagrange equation, necessary and sufficient conditions for extrema, variational methods for boundary value problems in ordinary and partial differential equations.

Linear integral equation of the first and second kind of Fredholm and Voltra type, solutions with separable kernels, characteristic numbers and eigenfunctions, resolvent kernel.

UNIT – VIII

Graph Theory

Graphs, subgraphs, digraphs, connectedness, Euler graph, trees, spanning trees, connectivity and separability, isomorphism, planar graph, matrices associated with a graph, chromatic partitioning and chromatic polynomial.

UNIT – IX

Operation Research

Linear programming problem, Simplex method, two phase method, Big –M method, inventory models with and without shortages, inventory control with price breaks, Queuing theory, steady state solution of Markov Queuing models: M/M/1 and M/M/C.

Convex sets and convex functions, K-T conditions, quadratic programming.

UNIT – X

Statistics

Sample space, discrete probability, independent events, Bayes' Theorem, random variables and distribution functions, expectation and moments, independent random variables, Standard discrete and continuous univariate distributions, Poisson, Binomial and Normal distributions. Methods of estimation, Z-test, T-test, Chi-square test, F-test. Curve fitting, regression and correlation.

COMPUTER SCIENCE

(Code No. GKV - 23)

Note :

- (i) Paper setter shall set 100 questions from the syllabus and each question shall carry one mark.
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UNIT-I Research Methodology

Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches , Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is done, Research Process, Criteria of Good Research, Necessity of Defining the Problem, Technique involved in Defining the Problem, Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Design.

UNIT-II Algorithm Design and Analysis

Elementary Data Structures; Divide and Conquer: Binary Search, Finding Maximum and Minimum, Mergesort; Greedy Method: Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Patterns; Dynamic Programming: Multistage Graphs, Optimal Binary Search Trees, 0/1 Knapsack, Reliability Design, Traveling Salesperson Problem; Backtracking: 8 – Queens Problem, Sum of Subsets, Hamiltonian Cycles, Knapsack Problem; Basic Search and Traversal Techniques: Techniques, Code Optimization, Biconnected Components and Depth – First Search; Non-Deterministic Algorithm: Non-Deterministic Programming Constructs, Simple Non-Deterministic Programs; NP-Hard and NP-Complete Problems.

UNIT-III Advanced Networking

Circuit Switching Networks :AT & T's Dynamic Routing Network, Routing in Telephone Network, Dynamic Non Hierarchical Routing, Trunk Status Map Routing, Real Time Network Routing, Dynamic Alternative Routing, Distributed Adaptive Dynamic Routing, Optimized Dynamic Routing; Packet Switching Networks: Distance Vector Routing-Link State Routing-Inter Domain Routing, Classless Inter- domain Routing, Interior Gateway Routing Protocols, Routing Information Protocol, Open Shortest Path First, Exterior Gateway Routing Protocol, Border Gateway Protocol, Apple Talk Routing and SNA Routing; High Speed Networks : Routing in Optical Networks, The Optical Layer, Node Designs, Network Design and Operation, Optical Layer Cost Tradeoffs, Routing and Wavelength Assignment, Architectural Variations, Routing in ATM Networks, ATM Address Structure, ATM Routing, PNNI Protocol, PNNI Signaling Protocol, Routing in the PLANET Network and Deflection Routing.

UNIT-IV Theory of Computer Science

Introduction to Languages; Recursive Definitions; Regular Expressions; Finite Automata; Kleen' S Theorem; Non- Deterministic Finite Automata; Finite Automata with Output; Regular Languages; Pumping Lemma for Regular Languages; Non-Regular Languages; Context-Free Grammars; Regular Grammars; Chomsky's Normal Form: Adding a Pushdown Stack to FA, Push Down Automata; Self Embeddedness, Context Free Languages (CFLs), Pumping Lemma for CFLs, Turing and Post Machines; Recursively Enumerable Languages; Encoding of Turing Machines; Phrase Structure Grammar, Context- Sensitive Grammar, Computer and Computable Functions.

UNIT-V Software Engineering

Software Life Cycle Models: SDLC Models, Selection of a Life Cycle Model; Software Requirements Analysis and Specifications: Requirements Engineering, Requirements Elicitation, Requirements Analysis, Requirements Documentation; Software Project Planning: Size Estimation, Cost Estimation, Models, Constructive Cost Model, Software Risk Management; Software Design: Design Definition, Modularity, Strategy of Design, Function Oriented Design, IEEE Recommended Practice for Software Design Description, Object Oriented Design; Software Metrics: Software Metrics, Token Count, Data Structure Metrics, Information Flow Metrics, Metrics Analysis; Software Reliability: Basic Concepts, Software Quality, Software Reliability Models, Capability Maturity Model; Software Testing: Testing Process, Functional Testing, Structural Testing, Levels of Testing, Debugging, Testing Tools; Software Maintenance: Maintenance Process, Maintenance Models, Estimation of Maintenance Costs, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management.

UNIT-VI**Optimization Techniques**

Linear Programming: Simplex Method, Standard LP form and its Basic Solutions, Simplex Algorithm, Artificial Starting Solution; Duality: Dual Problems, Relationship between the Optimal Primal and Dual Solutions, Dual Simplex Method, Primal Dual Computation; Transportation and Assignment Model: Transportation Model, Non- traditional Transportation Model, Transportation Algorithms, Assignments Model; Deterministic Dynamic Programming: Recursive Nature of Computing, Forward and Backward Recursion; Queuing Theory: Queuing System, Characteristics of Queuing Models, Transient and Steady State of Queuing System, Birth- Death Process, Pure Birth & Pure Death Processes, (M/M/1):(FIFO/ ∞ /), (M/M/S):(FIFO/ /) and (M/M/1):(FIFO/N/) Models.

UNIT-VII**Digital Image Processing**

Introduction: Digital Image Representation, Steps in Image Processing, Elements of Digital Image Processing Systems; Digital Image Fundamentals: Elements of Visual perception, A Simple Image Model, Sampling and Quantization, Basic Relationships between Pixels, Imaging Geometry, Photographic Film; Image Transforms: Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Separable Image Transform, Hotelling Transform; Image Enhancement: Enhancement by Point Processing, Spatial Filtering, Enhancement in the Frequency Domain, Generation of Spatial Masks from Frequency Domain Specifications, Color Image Processing; Image Restoration: Degradation Model, Diagonalisation of Circulate and Block Circulate Matrices, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square (Wiener) Filter, Constrained Least Squares Restoration, Interactive Restoration; Image Compression: Image Compression Models, Elements of Information Theory, Error-Free Compression, Lossy Compression, Image Compression Standards.

UNIT-VIII**Parallel and Distributed Computing**

Introduction: Computational Demands of Modern Science, Advent of Practical Parallel Processing; PRAM Algorithms: Model of Serial Computation, PRAM Model of Parallel Computation, PRAM Algorithms, Reducing the Number of Processors; Mapping and Scheduling: Mapping Data to Processors on Processor Arrays and Multi- computers, Dynamic Load Balancing on Multicomputers, Static Scheduling on UMA Multiprocessors, Deadlock; Elementary Parallel Algorithms: Classifying MIMD Algorithms, Reduction, Broadcast, Prefix Sums; Sorting: Enumeration Sort, Lower Bounds on Parallel Sorting, Odd- Even Transposition Sort, Quicksort- Based Algorithms, Random Read and Random Write; Graph Algorithms: Searching a Graph, Connected Components, All- paired Shortest Path, Single- source Shortest Path, Minimum- cost Spanning Tree.

Introduction To Distributed Network Systems: LAN, WAN, NOS, DOS, Distributed File Servers, Distributed Real Time Systems, Client- server Computing; Procedure Call Mechanism and Message Passing.

UNIT-IX**Soft Computing**

Fundamentals of ANN: The Biological^oNeural Network, Artificial Neural Networks, Building Blocks of ANN; ANN Terminologies: Architecture, Setting of Weights, Activation Functions, Mcculloch- Pitts Neuron Model, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule; Models of ANN: Single Layer Perception, Architecture, Algorithm, Application Procedure, Feedback Networks: Hopfield Net and BAM, Feed Forward Networks: Back Propagation Network (BPN) and Radial Basis Function Network (RBFN), Self Organizing Feature Maps: SOM and LVQ.

Fuzzy System : Fuzzy Sets, Properties and Operations - Fuzzy Relations, Cardinality, Operations and Properties of Fuzzy Relations, Fuzzy Composition; Fuzzy Variables, Types of Membership Functions, Fuzzy Rules: Takagi and Mamdani – Fuzzy Inference Systems: Fuzzification, Inference, Rulebase, Defuzzification.

Genetic Algorithm (GA): Biological Terminology, Elements of GA: Encoding, Types of Selection, Types of Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorem of GA, Building Block Hypothesis.

UNIT-X**Current Trends and Technologies**

Mobile Computing : Mobile Connectivity, Cells, Framework, Wireless Delivery Technology and Switching Methods, Mobile Information Access Devices, Mobile Data Internetworking Standards, Cellular Data Communication Protocols, Mobile Computing Applications; Mobile Databases – Protocols, Scope, Tools and Technology.

Security and Cryptography : Introduction to Security, Security Attacks, Services and Mechanisms, Data Encryption Standard, Advanced Encryption Standard, Public- key Cryptography and RSA, Message Authentication and Hash Functions, Hash and MAC Algorithms, Digital Signatures and Authentication Protocols; Network Security : Authentication Applications, Electronic Mail Security, IP Security, Web Security, Intruders, Malicious Software, Firewalls.

ZOOLOGY

(Code No. GKV - 24)

Note :

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UNIT -I Cellular Organization

Membrane structure and function: Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

Structural organization and function of intracellular organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility.

Organization of genes and chromosomes: Operon, interrupted genes, gene families, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, transposons.

Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.

UNIT -II Fundamental Processes

DNA replication, repair and recombination: Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms.

RNA synthesis and processing: Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport.

Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post- translational modification of proteins.

Control of gene expression at transcription and translation level: Regulation of phages, viruses, prokaryotic and eukaryotic gene expression, role of chromatin in regulating gene expression and gene silencing.

UNIT -III Cell Communication and Cell Signaling

Host parasite interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.

Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component signaling systems, bacterial chemotaxis and quorum sensing.

Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.

Cancer: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

UNIT -IV Developmental Biology

Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.

Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals.

Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, amphibia and chick; organogenesis- vulva formation in Caenorhabditis elegans; eye lens induction, limb development and regeneration in

vertebrates; differentiation of neurons, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development; sex determination.

UNIT -V

System Physiology- Animal

Blood and circulation: Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis.

Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above.

Respiratory system: Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.

Nervous system: Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.

Sense organs: Vision, hearing and tactile response.

Excretory system: Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.

Thermoregulation: Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization.

Digestive system: Digestion, absorption, energy balance, BMR.

Endocrinology and reproduction: Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes, neuroendocrine regulation.

UNIT -VI

Inheritance Biology

Mendelian principles: Dominance, segregation, independent assortment, deviation from Mendelian inheritance.

Concept of gene: Allele, multiple alleles, pseudoallele, complementation tests.

Extensions of Mendelian principles: Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids.

Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.

Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.

Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutants, insertional mutagenesis.

Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications.

Recombination: Homologous and non-homologous recombination, including transposition, site-specific recombination.

UNIT- VII

Diversity of Life Forms

Principles and methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of taxonomy of animals.

Levels of structural organization: Unicellular, colonial and multicellular forms; levels of organization of tissues, organs and systems; comparative anatomy.

Natural history of Indian subcontinent: Major habitat types of the subcontinent, geographic origins and migrations of species; common Indian mammals, birds; seasonality and phenology of the subcontinent.

Organisms of health and agricultural importance: Common parasites and pathogens of humans and domestic animals.

UNIT -VIII

Ecological Principles

The Environment: Physical environment; biotic environment; biotic and abiotic interactions.

Habitat and niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Population ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations.

Species interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

Community ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.

Ecological succession: Types; mechanisms; changes involved in succession; concept of climax.

Ecosystem: Structure and function; energy flow and mineral cycling (CNP); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine).

Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

UNIT -IX

Evolution And Behaviour

Emergence of evolutionary thoughts: Lamarck; Darwin—concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; spontaneity of mutations; the evolutionary synthesis.

Origin of cells and unicellular evolution: Origin of basic biological molecules; abiotic synthesis of organic monomers and polymers; concept of Oparin and Haldane; experiment of Miller (1953); the first cell; evolution of prokaryotes; origin of eukaryotic cells; evolution of unicellular eukaryotes; anaerobic metabolism, photosynthesis and aerobic metabolism.

Paleontology and evolutionary history: The evolutionary time scale; eras, periods and epoch; major events in the evolutionary time scale; origins of unicellular and multicellular organisms; major groups of plants and animals; stages in primate evolution including Homo.

Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; molecular tools in phylogeny, classification and identification; protein and nucleotide sequence analysis; origin of new genes and proteins; gene duplication and divergence.

Brain, Behavior and Evolution: Approaches and methods in study of behavior; proximate and ultimate causation; altruism and evolution-group selection, kin selection, reciprocal altruism; neural basis of learning, memory, cognition, sleep and arousal; biological clocks; development of behavior; social communication; social dominance; use of space and territoriality; mating systems, parental investment and reproductive success; parental care; aggressive behavior; habitat selection and optimality in foraging; migration, orientation and navigation; domestication and behavioral changes.

UNIT -X

Methods

Molecular biology and recombinant DNA methods: Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods; analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, isoelectric focusing gels; molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems; expression of recombinant proteins using bacterial and animal vectors; isolation of specific nucleic acid sequences; generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors; in vitro mutagenesis and deletion techniques, protein sequencing methods, detection of post-translation modification of proteins; DNA sequencing methods, strategies for genome sequencing; methods for analysis of gene expression at RNA and protein level, large scale expression analysis, such as micro array based techniques; isolation, separation and analysis of carbohydrate and lipid molecules.

Histochemical and immunotechniques: Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy, detection of molecules in living cells, in situ localization by techniques such as FISH and GISH.

Biophysical methods: Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, structure determination using X-ray diffraction and NMR; analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.

Statistical Methods: Measures of central tendency and dispersal; probability distributions (Binomial, Poisson and Normal); sampling distribution; difference between parametric and non-parametric statistics; confidence interval; errors; levels of significance; regression and correlation; t-test; analysis of variance; X² test.

Microscopic techniques: Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.

Methods in field biology: Methods of estimating population density of animals, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization-ground and remote sensing methods.

BOTANY
(Code No. GKV-25)

Note :

- (i) Paper setter shall set 100 questions from the syllabus and each question shall carry one mark.
- (ii) Number of questions should be set equally from each unit (ten questions from each unit) of the prescribed syllabus for RET.

UNIT-I Cell Biology

Structure and function of cell and cell organelles, mitosis and meiosis; DNA as genetic material, mechanisms and regulation of prokaryotic and eukaryotic DNA replication, transcription, translation; DNA replication in prokaryotes and eukaryotes, enzymes and accessory proteins involved in DNA replication; different models of DNA replication; origin of replication, replicon, priming, initiation and elongation; enzyme involved in DNA replication.

UNIT-II Biochemistry

Fundamentals of biochemistry, concept of pH, acids, bases, and buffers, enzymes- introduction, mechanism of activity, nomenclature, enzyme catalytic mechanism, factors affecting enzyme activity; classification, enzyme; amino acids; carbohydrate- monosaccharides- disaccharides, polysaccharides; fatty acids.

UNIT-III Physiology

Response of plants to biotic and abiotic stresses; active and passive transport across membrane; plant growth hormones and their mechanism of action; photosynthesis- light harvesting complexes, mechanisms of electron transport, CO₂ fixation-C₃, C₄ and CAM pathways; respiration and photorespiration-citric acid cycle, mitochondrial transport and ATP synthesis; nitrogen metabolism.

UNIT-IV Plant Tissue culture

Introduction to cell and tissue culture technique to produce novel plants and hybrids; micropropagation; somatic embryogenesis; totipotency; hybrid and cybrids; organ culture, protoplast culture and organogenesis; shoot-tip culture: production of virus-free plants; GM plants- generation and maintenance of transgenic plants; Isolation, culture and preservation of protoplast, protoplast fusion and somatic hybridization, selectable genetic markers and biochemical markers.

UNIT V Genetics

Principles of Mendelian inheritance; chromosome structure and function; gene structure and regulation of gene expression; linkage, crossing over, Griffith's experiment of transformation, Hershey and Chase experiment, Avery, McLeod and McCarty experiment, conjugation, transformation; cytoplasmic inheritance, recombination and chromosome mapping in eukaryotes; sex chromosomes and sex determination, dosage compensation of X-linked gene; karyotyping, polyploidy and aneuploidy.

UNIT-VI Microbiology

Spontaneous generation, germ theory of diseases, Koch's postulates; general characteristics of protozoa, fungi, algae, cyanobacteria, rickettsiae, mycoplasma, spirochetes and archaeobacteria; basic concept of classification of microorganism, Haeckel's three kingdom concept, Whittaker's five kingdom concept, molecular approaches in microbial classification, classification and silent features of bacteria based on Bergey's manual of Determinative bacteriology; Gram-negative, Gram-positive eubacteria.

UNIT-VII Virology

Brief out lines on discovery of viruses, ultrastructure, capsid and its arrangements, types of envelopes and its composition; viral genomes, its type and structure; TMV and HIV viruses; prions- spread of prions and diseases; lytic and lysogenic cycle, T₄, phage I and M13; plant viruses and animal viruses.

UNIT VIII Mycology and Plant Pathology

History and development of mycology; general account of Myxomycota, Eumycota, Ascomycotina, Basidiomycotina and Deuteromycotina; history of plant pathology; pathogenesis; symptoms of plant diseases; causes, diagnosis and stage of development of plant diseases; Early and late blight of potato; loose smut of wheat, false smut of paddy, Fusarium wilt, powdery mildew of pea; red rot of sugarcane; stem and root rot disease of crops.

UNIT IX Statistical methods

Measures of central tendency and dispersal; probability distribution (Binomial, Poisson and Normal), sampling distribution, difference between parametric and non-parametric statistics, confidence interval; errors; level of significance' regression and correlation; t-test, analysis of variance, chi-square test.

UNIT-X**Microscopic techniques**

isualization of cells and subcellular components by light microscopy, resolving power of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, image processing methods in microscopy.

MICROBIOLOGY

(Code No. GKV - 26)

Note :

- (i) Paper setter shall set 100 questions from the syllabus and each question shall carry one mark.
- (ii) Number of questions should be set equally from each unit (ten questions from each unit) of the prescribed syllabus for RET.

UNIT - I Principles and methods of taxonomy

Concepts of species and hierarchical taxa, biological nomenclature, classical and molecular methods of taxonomy of microorganisms. Important criteria used for classification in each taxon.

UNIT - II General features

Brief out lines on discovery of viruses, morphology of viruses; nomenclature and classification, distinctive properties, morphology, ultrastructure, capsid and its arrangements, types of envelopes and its composition; Viral genomes, its type and structure; Viroids – host range, genome and origin of viroids; cyanophages- morphology, growth cycle, mycoviruses- types of mycoviruses, replication, example of mycoviruses (mycoviruses of mushrooms and pathogenic fungi); Isolation and cultivation of viruses; prions- spread of prions and diseases.

UNIT - III Microbial diversity and extremophiles

Microbial diversity, distribution ecological niche, abundance and density. Extremophiles – Psychrophiles, acidophiles, alkaliphiles, thermophiles, barophiles, etc., non-culturable bacteria (Metagenomics). Methanogens, Methanotrophs and methylotrophs.

UNIT - IV Role of microbes in environment

Organic matter decomposition, factors affecting litter decomposition; Biogeochemical cycling of C, N, P and S; Microbial biomass and soil fertility; Biodegradation of hydrocarbons and xenobiotics, Microbial leaching of iron, and copper. Characterization of solid and liquid wastes, physical, chemical and biological (aerobic, anaerobic- primary, secondary, tertiary) treatment; Solid waste treatment; Liquid waste treatment- trickling, activated sludge, oxidation ponds,

UNIT - V Soil Microbiology

soil as a habitat for microorganisms, microflora of various soil types, Rhizosphere and rhizoplane microflora and its estimation, root exudates, its composition and effects on plants; Microbial interactions- symbiosis, mutualism, commensalisms, amensalism, competition, antibiosis; Actinorrhiza; Mycorrhizal fungi and its effect on plants. Biofertilizers (rhizobial inoculants, mass production and method of application); Biopesticides (viral, bacterial and fungal biopesticides)

UNIT - VI General considerations

Industrial strains, strategies for selection, improvement and maintenance. Metabolic pathways and metabolic control mechanisms; primarily metabolites (alcohols, vitamins, enzymes and organic acids) and secondary metabolites (antibiotics and toxins); substrates for industrial fermentation.

UNIT - VII Molecular biology and recombinant DNA methods

Isolation and purification of, RNA, DNA (genomic and plasmid) and proteins, different separation methods; analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, isoelectric focusing gels.

UNIT - VIII Recombinant DNA methods

Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems; expression of proteins using bacterial and eukaryotic systems vectors; isolation of specific nucleic acid sequences; generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors; gene knock out in bacterial and eukaryotic organisms; protein sequencing methods, strategies for genome sequencing, RFLP, RAPD and AFLP techniques.

UNIT - IX Statistical methods

Measures of central tendency and dispersal; probability distribution (Binomial, Poisson and Normal), sampling distribution, difference between parametric and non-parametric statistics, confidence interval; errors; level of significance' regression and correlation; t-test, analysis of variance, chi-square test.

UNIT - X Microscopic techniques

Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and. transmission microscopes, different fixation and staining techniques for EM, image processing methods in microscopy.

ENVIRONMENTAL SCIENCE

(Code No. GKV - 27)

Note :

- (i) Paper setter shall set 100 questions from the syllabus and each question shall carry one mark.
- (ii) Number of questions should be set equally from each unit (ten questions from each unit) of the prescribed syllabus for RET.

- UNIT-I** Definition, principles and scope of Environmental Science.
Earth, Man and Environment. Ecosystems, Pathways in Ecosystems.
Physico-chemical and Biological factors in the Environment.
Geographical classification and zones.
Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Mass and Energy transfer across the various interfaces, material balance. First and Second law of thermodynamics, heat transfer processes.
Natural resources, conservation and sustainable development.
- UNIT-II** **Fundamentals of Environmental Chemistry:** Stoichiometry, Gibbs' energy, Chemical potential, chemical equilibria, acid base reactions, solubility product, solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons, radionuclides.
Chemical composition of Air: Classification of elements, speciation. Particles, ions and radicals in the atmosphere. Oxygen and ozone chemistry, Chemistry of air pollutants, Photochemical smog.
Water Chemistry: Chemistry of water, concept of DO, BOD, COD, sedimentation, coagulation, filtration, Redox potential.
Soil Chemistry: Inorganic and organic components of soil, Nitrogen pathways and NPK in soils. Toxic Chemicals in the environment-Air, Water: Pesticides in water. Biochemical aspects of Arsenic, Cadmium, Lead, Mercury, Carbon Mono-oxide, O₃ and PAN Pesticides, Insecticides, MIC, carcinogens in the air.
Principles of Analytical Methods: Titrimetry, Gravimetry, Colourimetry, Spectrophotometry, Gas Chromatography, Chromatography, Atomic Absorption Spectrophotometry, GLC, HPLC, Electrophoresis. Flame photometry.
- UNIT-III** Definition, Principles and scope of ecology, Human ecology and Human settlement, Evolution, Origin of life and speciation.
Ecosystems: Structure and functions, Abiotic and Biotic components, energy flows, Food chains, food web, ecological pyramids, types and diversity.
Ecological succession, Population, Community ecology and Parasitism, Prey-Predator relationships.
Common flora and fauna in India
Aquatic: Phytoplankton, Zooplankton and Macrophytes.
Terrestrial: Forests Endangered and Threatened Species
Biodiversity and its conservation: Definition, 'Hotspots' of Biodiversity, Strategies for biodiversity conservation. National Parks and Sanctuaries'. Gene Pool.
Micro flora of Atmosphere: Air sampling techniques. Identification of aeroallergens. Air-borne diseases and allergies.
Environmental Biotechnology: Fermentation technology, Vermiculture technology, Biofertilizer technology.
- UNIT-IV** **Environmental Geosciences-** Fundamental Concepts.
The earth systems and Biosphere: Conservation of matter in various geospheres-lithosphere, atmosphere and biosphere. Energy budget of the earth. Earth's thermal environment and seasons. Ecosystems flow of energy and matter. Coexistence in communities-food webs. Earth's major ecosystems-terrestrial and aquatic. General relationship between landscape, biomes and climate. Climates of India, Indian Monsoon, El Nin, Droughts. Tropical cyclones and western Disturbances.
Earth's Processes and Geological Hazards: earth's processes; concept of residence, time and rates of natural cycles. Catastrophic geological hazards. Study of flood, landslides, earthquakes, volcanism and avalanche.
Mineral Resources and Environment: Resources and Reserves, Minerals and population. Oceans as new areas for exploration of mineral resources. Ocean ore and recycling of resources. Environmental impact of exploitation, processing and smelting of minerals.
Water Resources and Environment: Global Water Balance. Ice sheets and fluctuations of sea levels. Origin and composition of seawater. Hydrological cycle. Factors influencing the surface water.

	Types of water. Resources of oceans. Ocean pollution by toxic wastes. Human use of surface and groundwater's. Groundwater pollution.
	Landuse Planning: The landuse plan. Soil surveys in relation to landuse planning. Methods of site selection and evaluation.
	Principles of remote sensing and its application of environment sciences. Application of GIS in Environmental Management.
UNIT –V	Sun as source of energy; solar radiation and its spectral characteristics, Fossil fuels-classification, composition, physio-chemical characteristics and energy content of coal, petroleum and natural gas. Principles of generation of hydroelectric power. tidal, Ocean Thermal Energy Conversion, wind, geothermal energy; solar collectors, photovoltaic, solar ponds; nuclear energy-fission and fusion. Environmental implication of energy use; CO2 emissions, global warming; air and thermal pollution; radioactive waste and radioactivity from nuclear reactors; impacts of large-scale exploitation of solar, wind, hydro, and ocean energy.
UNIT-VI	Air: Natural and anthropogenic sources of pollution. Primary and secondary pollutants. Transport and diffusion of pollutants, Gas laws governing the behavior of pollutants in the atmosphere. Methods of monitoring and control of air pollution SO2, NOX, CO, SPM. Effects of pollutants on human beings, plants, animals, materials and on climate. Acid Rain. Air Quality Standards. Water: types, sources and consequences of water pollution. Physio-chemical and Bacteriological sampling and analysis of water quality. Standards. Sewage and waste water treatment and recycling. Water quality standard. Soil: Physio-chemical as bacteriological sampling as analysis of soil quality. Soil Pollution Control. Industrial waste effluents and heavy metals, their interactions with soil components. Soil micro-organisms and their functions, degradation of different pesticides, fungicides and weedicides in soil. Noise: Sources of noise pollution, measurement of noise and Indices, effect of meteorological parameters on noise propagation. Noise exposure levels and standards. Noise control and abatement measures. Impact of noise on human health. Marine: Sources of marine pollution and control. Criteria employed for disposal of pollutants in marine system-coastal management.
UNIT-VII	Radioactive and thermal Pollution. Introduction to environmental impact analysis. Environmental impact statement and Environmental Management Plan. EIA guidelines 1994, Notification of Government of India. Impact Assessment Methodologies. Generalized approach to impact analysis. Procedure for reviewing Environmental impact analysis and statement. Guidelines for Environmental audit. Introduction to Environmental planning. Urban planning for India. Rural planning and landuse pattern. Concept and strategies of sustainable development. Cost-Benefit analysis. Environmental priorities in India and sustainable development.
UNIT-VIII	Sources and generation of solid wastes, their characterization, chemical composition and classification. Different methods of disposal and management of solid wastes (Hospital waste and Hazardous waste). Recycling of waste material. Waste minimization technologies. Hazardous Waste Management and Handling Rules 1989. Resource Management, Disaster Management and Risk Analysis. Environment protection-issues and problems, international and national efforts for environment protection, provision of constitution on India regarding Environment (Article 48A and 58A). Environment Policy Resolution, Legislation, Public Policy Strategies in Pollution control; Wildlife Protection Act, 1972 amended 1991; Forest Conservation Act, 1980 Indian Forest Act (Revised) 1982; Air (Prevention and control of pollution) Act, 1981 as amended by Amendment Act 1987 and Rule 1982; Motor Vehicle Act, 1988; The water (Prevention and control of pollution) Act, 1974 as amended up to 1988 and rules 1975; The Environment (Protection) Act, 1986 and rules 1986.
UNIT-IX	Basic elements and tools of statistical analysis; Probability, sampling, measurement and distribution of attributes; distribution-Normal, Poisson and Binomial, Arithmetic, Geometric and Harmonic means; moments; matrices, simultaneous linear equations; tests of hypothesis and significance(t and).

UNIT-X

Introduction to environmental system analysis; approaches to development of models; linear simple and multiple regression models, validation and forecasting,. Models of population growth and interactions-Lotka-Volterra model, Leslie's matrix model, point sources stream pollution model, box model, Gaussian plume model.

Environmental Education and awareness.

Environmental Ethics and Global imperatives.

Global Environmental problems-ozone depletion, global warming and climatic change.

Current environmental issue in India.

Context: Narmada Dam, Tehri Dam, Almetti Dam, Soil Erosion, Formation and reclamation of Usar, Alkaline and Saline Soil.

Waste Lands and their reclamation.

Desertification and its control.

Vehicular pollution and urban air quality.

Depletion of nature resources.

Biodiversity conservation and agenda-21.

Environmental hazards.

Eutrophication and restoration of Indian lakes.

Rain water harvesting.

Epidemiological issues (e.g. Goitre, Fluorosis, and Arsenic)

SYLLABUS

Research Entrance Test (RET)

FOR

Ph.D.

2009 - 2010



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