ಪಠ್ಯ ಕ್ರಮ (Syllabus)

ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು ಹಾಗೂ ಆಯ್ಕೆ ಪ್ರಾಧಿಕಾರ, ವನವಿಕಾಸ, 1ನೇ ಮಹಡಿ,
18ನೇ ಅಡ್ಡ ರಸ್ತೆ, ಮಲ್ಲೇಶ್ವರಂ, ಬೆಂಗಳೂರು–560003

ನೆಡುತೋಪು ಅಧೀಕ್ಷಕ ಹುದ್ದೆಗಳನ್ನು ನೇರ ನೇಮಕಾತಿಯಿಂದ ತುಂಬುವುದಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಪರೀಕ್ಷೆಗಳ ಪಠ್ಯ ಕ್ರಮ (Syllabus)

I - ಕನ್ನಡ

ಪರೀಕ್ಷಾ ಅವಧಿ – 3 ಗಂಟೆ, 100 ಅಂಕಗಳು

ಭಾಗ – I : ಲೇಖನ ಬರೆಯುವುದು

ಯಾವುದಾದರೂ ಒಂದು ಪ್ರಸಕ್ತ ವಿಷಯವನ್ನು ಕುರಿತು 250–300 ಪದಗಳ ಲೇಖನವನ್ನು ಕನ್ನಡದಲ್ಲಿ ಬರೆಯುವುದು. (ಉದಾ : ಇಂದಿನ ಸಮಾಜದಲ್ಲಿ ಮಹಿಳೆಯ ಪಾತ್ರ / ಸಬಲೀಕರಣ : ಪ್ರಕೃತಿ / ಪರಿಸರ ಸಂರಕ್ಷಣೆಯಲ್ಲಿ ಸಮಾಜದ ಪಾತ್ರ : ಭಾರತೀಯ ಬಾಹ್ಯಾಕಾಶ ಸಂಶೋಧನೆ : ಕೇಂದ್ರ – ರಾಜ್ಯಗಳ ನಡುವಣ ಸಂಬಂಧ : ಸಾಮಾಜಿಕ ಪಿಡುಗುಗಳು ಸರ್ವಧರ್ಮ ಸಮನ್ವಯ : ಭಾರತದಲ್ಲಿ ಪ್ರಜಾಪ್ರಭುತ್ವ : ರಾಷ್ಟ್ರ ಪ್ರಗತಿಯಲ್ಲಿ ಯುವಜನರ ಪಾತ್ರ : ನಮ್ಮ ಮೂಲಭೂತ ಹಕ್ಕುಗಳು : ಇಂದಿನ ಶಿಕ್ಷಣ ಪದ್ಧತಿ : ಬುದ್ಧ ಮತ್ತು ಗಾಂಧಿ : ಅಂಬೇಡ್ಕರ್ : ಸಂಪ್ರದಾಯಗಳು : ಜಾಗತೀಕರಣದ ಪರಿಣಾಮಗಳು : ಭಯೋತ್ಪಾದಕತೆ ಮತ್ತು ಸರ್ಕಾರಗಳು : ಸಮೂಹ ಮಾಧ್ಯಮಗಳು : ವಿಶ್ವಸಂಸ್ಥೆ : ದೂರದರ್ಶನ : ಕೃತಕ ಮಳೆ : ಮಹಿಳಾ ಮೀಸಲಾತಿ : ಅಣುಬಾಂಬು : ಪುಸ್ತಕೋದ್ಯಮ : ಖಾಸಗೀಕರಣ : ಕನ್ನಡದ ಸ್ಥಿತಿಗತಿ : ಇತ್ಯಾದಿ)

ಭಾಗ – II : ಪದಗಳನ್ನು ನೀಡಿ ಅವುಗಳನ್ನು ಬಿಡಿಸಿ ಸಂಧಿಯನ್ನು ಹೆಸರಿಸುವಂತೆ ಕೇಳುವುದು

ವಾಕ್ಯ ಪರಿವರ್ತನೆ : ನಿಶ್ಚಯ ಸೂಚಕ – ಭಾವಸೂಚಕ : ಪ್ರಶ್ನಾರ್ಥಕವಾಗಿ ಪರಿವರ್ತಿಸುವಂತೆ ಕೇಳುವುದು : ಪ್ರಶ್ನಾರ್ಥಕ – ಹೇಳಿಕೆಯಾಗಿ ಪರಿವರ್ತನೆ : ವಾಕ್ಯಗಳ ದೋಷ – ನಿವಾರಣೆ : ಸ್ವರ – ವ್ಯಂಜನ ದೋಷ : ಅಲ್ಪಪ್ರಾಣ – ಮಹಾಪ್ರಾಣ ವಚನಗಳ ಬಗೆಗಿನ ದೋಷಗಳು : ಪದಗಳ ಸ್ಥಾನಪಲ್ಲಟ ವಾಕ್ಯದೋಷ : ಪದಗಳ ಬಳಕೆಯೊಡನೆ ವಾಕ್ಯ ರಚನೆ (ಉದಾ : ಸುಧಾರಿಸು, ಕಳವಳ, ನಿರಂತರ) ಲೇಖ ಚಿಹ್ನೆಗಳು : ಪೂರ್ಣ ವಿರಾಮ / ಅರ್ಧವಿರಾಮ / ಪ್ರಶ್ನಾರ್ಥಕ / ಭಾವಸೂಚಕ : ಉದ್ಧರಣ ಚಿಹ್ನೆ.

ಭಾಗ – III : ಅರ್ಥಗ್ರಹಣ ಪರೀಕ್ಷೆ

ಗದ್ಯ : ಪದ್ಯ ಭಾಗ ನೀಡಿ (ಅಪೇಕ್ಷೆ – ಸರಿಯಾದ ಉತ್ತರ, ಉತ್ತಮ ಭಾಷೆ : ಶೈಲಿ)

ಭಾಗ – IV : ಸಂಕ್ಷೇಪಣಾ ಲೇಖನ (Precis Writing)

ಮೂಲವನ್ನು ಅರ್ಥ ಕೆಡದಂತೆ ಅದರ ಮೂರನೆಯ ಒಂದರಷ್ಟಕ್ಕೆ ಸಂಕ್ಷೇಪಿಸುವುದು, ಸೂಕ್ತ ಶೀರ್ಷಿಕೆ ನೀಡುವುದು.

ಭಾಗ – V : ಶಬ್ದ ಭಂಡಾರ ಪರೀಕ್ಷೆ (Vocabulary)

ಸಮಾನಾರ್ಥಕ (ಉದಾ : ಅಂಗನೆ – ಹೆಣ್ಣು, ಸ್ತ್ರೀ, ಅಂಚು – ಕೊನೆ) ವಿರುದ್ಧಾರ್ಥಕ ಪದಗಳು (ಉದಾ : ಅಂಕುಶ : ನಿರಂಕುಶ, ಆತಂಕ – ನಿರಾತಂಕ)

ಭಾಗ – VI : ನುಡಿಗಟ್ಟುಗಳು ಮತ್ತು ಪಡೆನುಡಿಗಳು (Idioms and Phrases)

ಕೆಲವು ನುಡಿಗಟ್ಟುಗಳನ್ನು ನೀಡಿ ವಾಕ್ಯ ರಚನೆ ಮಾಡುವುದು.

ಭಾಗ – VII : ನುಡಿಗಟ್ಟುಗಳು ಗಾದೆಗಳ ಅರ್ಥ ವಿವರಣೆ : 15 – 20 ಪಂಕ್ತಿಗಳಲ್ಲಿ

ನೀಡಿರುವ ಲೋಕಪ್ರಿಯ ಗಾದೆಗಳಿಗೆ ಅರ್ಥವನ್ನು ಸರಳ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸುವುದು.

ಭಾಗ – VIII : ಪತ್ರಲೇಖನ ಕೌಶಲ (Communication skill)

ಅಭ್ಯರ್ಥಿಯು ಒಂದು ಪತ್ರವನ್ನು ಬರೆಯಬೇಕು (ಸರ್ಕಾರಿ / ಖಾಸಗಿ ಉದ್ಯಮ ಸೇವೆಯಲ್ಲಿ ಇದ್ದು ಸ್ವಂತ ಕಾರ್ಯಕ್ಕಾಗಿ ಮೇಲಾಧಿಕಾರಿಗಳಿಂದ ರಜೆ ಬೇಡುವುದು ಅಥವಾ ಸ್ನೇಹಿತನಿಗೆ ಅವನು ಸಾರ್ವಜನಿಕವಾಗಿ ಪರೀಕ್ಷೆಯಲ್ಲಿ ತೇರ್ಗಡೆ ಹೊಂದಿರುವುದಕ್ಕೆ ಶುಭಾಶಯ ವಂದಿಸುತ್ತಾ ಪತ್ರ ಬರೆಯುವುದು ಅಥವಾ ಸ್ನೇಹಿತನಿಗೆ ಅವರ ಬಂಧುವಿನ ದೇಹಾಂತ್ಯ ಹೊಂದಿರುವುದಕ್ಕೆ ಶೋಕ ಹಾಗೂ ಸಹಾನುಭೂತಿ ಹೇಳುತ್ತಾ ಇತ್ಯಾದಿ)

ಭಾಗ – IX : ಭಾಷಾಂತರ (Translation)

ಇಂಗ್ಲೀಷ್‌ನಿಂದ ಕನ್ನಡಕ್ಕೆ ಭಾಷಾಂತರ (ಇಂಗ್ಲೀಷ್‌ನಲ್ಲಿ ಕೊಟ್ಟಿರುವ ಒಂದು ಲೇಖನವನ್ನು ಕನ್ನಡಕ್ಕೆ ಭಾಷಾಂತರಿಸುವುದು)

ಭಾಗ – X : ಕನ್ನಡ ನಾಡು : ನುಡಿಗಳ ಬಗ್ಗೆ ಸಂಕ್ಷಿಪ್ತ ಜ್ಞಾನ ಅಪೇಕ್ಷಣೀಯ

ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ, ಕಲೆ, ವಾಸ್ತುಶಿಲ್ಪ, ಚಲನಚಿತ್ರ ಮೊದಲಾದ ಕ್ಷೇತ್ರಗಳಲ್ಲಿ ಸಾಧನೆಯ ಹೆಗ್ಗುರುತುಗಳ ಜ್ಞಾನ ಪರೀಕ್ಷೆ ಇದಾಗಬೇಕು. ಕನ್ನಡ / ಕರ್ನಾಟಕ ಪ್ರಥಮಗಳ ಬಗ್ಗೆ ಜ್ಞಾನ ಅಪೇಕ್ಷಣೀಯ. ಈ ಕುರಿತು ಬಹು ಆಯ್ಕೆ ಪ್ರಶ್ನೆ (Multiple choice) ಗಳನ್ನು ಕೇಳುವುದು.

ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ಮಾದರಿ:

ಈ ಪರೀಕ್ಷೆಗೆ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ ಸಿದ್ಧಪಡಿಸುವಾಗ ಅಭ್ಯರ್ಥಿಗಳ ಕನ್ನಡ ಜ್ಞಾನ ಪರೀಕ್ಷಿಸುವುದೇ ಮುಖ್ಯ ಗುರಿಯಾಗಬೇಕು. ಎಲ್ಲಾ ಪರೀಕ್ಷಾರ್ಥಿಗಳೂ ಕನ್ನಡ ವ್ಯಾಸಂಗ ಮಾಡಿರಲೇಬೇಕಾದ ಅಗತ್ಯತೆ ಇಲ್ಲದಿರುವುದರಿಂದ ವ್ಯಾವಹಾರಿಕ ಜ್ಞಾನಕ್ಕೆ ಅಗತ್ಯ ನೀಡುವುದು ಅಪೇಕ್ಷಣೀಯ.

ಭಾಗ ಅ : ಬಹು ಆಯ್ಕೆ ಪ್ರಶ್ನೆಗಳು

1 ಕನ್ನಡ ನಾಡು / ನುಡಿಗಳ ಬಗ್ಗೆ ಸಂಕ್ಷಿಪ್ತ ಜ್ಞಾನ	– 10 ಅಂಕಗಳು
2 ಗಾದೆಗಳ ಅರ್ಥ ವಿವರಣೆ	– 10 ಅಂಕಗಳು
3 ಶಬ್ದ ಭಂಡಾರ ಪರೀಕ್ಷೆ	– 5 ಅಂಕಗಳು

ಭಾಗ ಆ : ವಿವರಣಾತ್ಮಕ ಪ್ರಶ್ನೆಗಳು

1 ಲೇಖನ ಬರೆಯುವುದು	– 15 ಅಂಕಗಳು
2 ಪದಗಳನ್ನು ನೀಡಿ ಅವುಗಳನ್ನು ಬಿಡಿಸಿ ಸಂಧಿಯನ್ನು ಹೆಸರಿಸುವುದು	– 10 ಅಂಕಗಳು
3 ಸಂಕ್ಷೇಪಣಾ ಲೇಖನ	– 15 ಅಂಕಗಳು
4 ನುಡಿಗಟ್ಟುಗಳು ಹಾಗೂ ಪಡೆನುಡಿಗಳು	– 15 ಅಂಕಗಳು
5 ಪತ್ರ ಲೇಖನ ಕೌಶಲ್ಯ	– 15 ಅಂಕಗಳು
6 ಅರ್ಥಗ್ರಹಣ ಪರೀಕ್ಷೆ	– 5 ಅಂಕಗಳು

II - English

Duration - 3 hours, 100 Marks

Section-1 - Comprehension
From a given passage (prose or poem) comprehend and identify the central theme and answer questions based thereon. The candidate would not be asked to evaluate or assess the argument, its tone or style.

Section-2 - Use of verbs, articles and prepositions
Use of verbs, articles and prepositions in different context, Construction of sentences. Detecting common mistakes in the usage of verbs, articles and prepositions.

Section-3 - Vocabulary
Knowledge of words, phrases and idiomatic expressions in common English usage to describe different activities, situation and context. Differentiate between the usage and meaning of words having similar vocalization (example: flora / fauna: efficiency / efficacy /effectiveness; price / prize; affect / effect, etiquette / attitude etc,) and detect the commonly committed mistakes. Construction of sentences.

Section–4 - Letter writing
Writing letters on following themes:
a) seeking leave of absence from *duty* to attend to a personal work from the employer / official superior.
b) writing a letter to the editor of a leading newspaper or magazine expressing candidate's views on a topic of general or local importance.
c) writing a letter of condolence to a friend or a colleague on the demise of a close relative or friend
d) writing a letter congratulating a friend on his promotion or election to an office
    of prestige or influence or on his passing a public exam or on a happy event like wedding or birth in the friend's family.
e) writing a letter to a close friend or family member informing him or her about the candidate's travel to an existing place and witnessing an unusual event

Section- 5 - Precis writing
Read and understand a given passage, shifting the essential from the non-essential information and prepare a cohesive summary not exceeding 1/3rd the size of the given passage and to give a suitable eye catching title.

Section-6 - Essay writing
Write an essay of 250 to 300 words on a matter of topical interest (political, economic religious, cultural, environmental, social, socio-economic etc.)

Pattern of the question paper

Part-A Objective type
Fill in the blanks, choosing the correct answer from a multiple choice or giving one sentence/word answer, stating true or false- twenty five questions for one mark each -25 marks

Part -B: Descriptive type
Comprehension   - 5 marks
Vocabulary   - 5 marks
Letter writing   -15 marks
Precis writing   -25 marks.
Essay writing   -25 marks.

III APTITUDE TEST

Preliminary Exam -Two hours, 100 marks

The aptitude test shall measure the candidate's comprehension, memory, reasoning, speed, analysis, evaluation of facts, data, events and judgement. The question paper would be of hundred multiple choice questions divided into six sections.

1.   Numerical ability - 30 marks
2.   Verbal and non-verbal ability -15 marks
3.   Logical and analytical reasoning -20 marks
4.   Statistics-15 marks
5.   Science aptitude- 20 marks

Scope and coverage

❖   **Numerical ability**

Candidates would be tested on their understanding of basic arithmetic and speed of calculation:, number systems, averages, percentages, profit and loss, simple and compound interest, sequences, indices, ratio and proportion, partnership, time and work, speed and distance, algebra, trigonometry , heights and distances, mensuration, geometry.

❖   **Verbal and non-verbal ability**
Letters and words as symbols, analysis relationship between groups of letters or words, completing series or order of letters or word analogy, finding odd man out, coding and decoding based on illustrated principles. Shapes and patterns, arranging shapes or designs into associated groups and finding out the odd man and completing the sequence.

❖   **Logical and analytical reasoning**

Application of logic and making judgments in given situations.
General reasoning and determination of the validity of an inference from a statement based on some given parameters.

❖   **Statistics**
Elementary statistics such as mean, median, mode, making deductions from pie and bar charts, graphs, figures and tables.

❖   **Science aptitude**

Fundamentals of physics, chemistry, botany, zoology, environment and their application in day to day life.

III GENERAL KNOWLEDGE

Preliminary Exam -two hours duration, 100 marks

The question paper would be of hundred multiple choice questions divided into six sections.

1.	Current events	-	30 marks
2.	History of India	-	20 marks
3.	Indian and World geography	-	15 marks
4.	Indian polity	-	10 marks
5.	Indian Economy	-	10 marks
6.	General Science	–	15 marks.

Scope and coverage

❖ **Current events**

Significant national and international events, personalities (both Indian and International) in news, including sports events and personalities.

❖ **History of India**
Ancient, medieval and recent history including the Indian national movement, its social, economic and political aspects including the nature and character of the 19th century resurgence, growth of nationalism and attainment of independence.

❖ **Geography**

The earth, its shape and size, latitudes and longitudes, ocean currents and tides, atmosphere and its composition including physical, social and economic geography of India, its climate, vegetation, natural resources, location and distribution of agricultural and industrial activities.

❖ **Indian Polity**
The country's political system and Constitution of India, covering broadly its frame work, main features, different organs of Government and their functioning at the Centre, State and local levels including Panchayati Raj institutions. Fundamental rights, Fundamental duties and Directive principles of state policy, Functioning of Indian democracy and elections.

❖ **Indian Economy**

Economic developments in India, basic foundation of the economy, features and sectors of Indian economy, process of planning and five year plans, markets and State controls, process of liberalization and globalisation, inflation, poverty and unemployment.

❖ **General Science**

General appreciation and understanding of science including matters of every day observation and experience, as may be expected of a well-educated person who may not have made a special study of any particular scientific discipline.

V. PHYSICS

Duration – 3 Hours, 100 Marks

Section - 1
Laws of motion

Frame of reference: inertial frame, non inertial frames, center of mass and laboratory frame. Uniform circular motion centripetal and centrifugal forces, concept of Corioli's force. Conservation of linear momentum, motion of rockets. Conservation of angular momentum, central force, Kepler's law (derivation), Conservation of energy. Elements of satellite motion. Stationary satellites, weightlessness, artificial gravity in space stations. Elasticity : Hooks law, relation between elastic constants, theory of cantilevers, torsional pendulum.

Section- 2
Heat and thermodynamics

Kinetic theory: Distribution of molecular velocities (Concept), mean free path, degree of freedom, principle of equipartition of energy. Thermodynamics. First law of thermodynamics, isothermal and adiabatic changes, work done during adiabatic process. Second law of thermodynamics, Carnot engine and its efficiency, Refrigerator, Absolute scale of temperature, Clausius-Clepeyron first latent heat equation, entropy, liquefaction of gases, porous plug experiment, expression for temperature of inversion, principle of regenerative cooling. Third law of thermodynamics, Distribution of energy in the black body radiations. Reyleigh Jeans Law, Wein's Law, Stefan's Law, Temperature of Sun, derivation of Planks law.

Section -3
Sound

Progressive Waves: Equation for wave in one-dimension, differential equation for wave motion relation between amplitude and intensity. Expression for velocity of progressive waves in a medium, Newton's formula, Laplace's correction, longitudinal vibrations in a rod, expressions for frequency of vibrations of a stretched string harmonics.

Section -4
Light

Wave theory of Light, Concept of wave front, Phase difference, path difference and their relation, Huygen's principle. Interference : Theory of interference, expression for fringe width, interference by division of wave front-Fresnel's biprisim, interference by division of amplitude-thin film of uniform thickness, Newton's rings. Diffraction : Fresnel's and Fraunhoffer's diffraction, theory of zone-plate, comparison with convex lens, Fresnel's diffraction at a straight edge, Fraunhoffer's diffraction at a single slit, transmission grating. Polarisation : Double-refraction in a uniaxial crystal, Huygen's theory, Positive and negative crystals, Retarding plate, production and analysis of linearly, Circularly and elliptically polarized light ,optical activity.

Section – 5
Electricity and electromagnetism

Electro Statics : Fundamentals of electrostatics, Coulomb's law, Gauss theorem, magnetic and mechanical effects of current. A.C. circuits : RMS value, average (Mean) value. Phasor diagrams, responses of LR, CR & LCR circuits to sinusoidal voltages, series and parallel resonances, Q-factor, power factor (using phasor diagrams), physical signifance of grad., div. and curl. Electromagnetic Theory : Concept of dipole, Amperes, circuital Law, current loop

as a dipole, Hertz experiment, Equation for plane, electromagnetic waves, Maxwell's equations, Poynting theorem.

Section -6
Atomic Physics

E/m by J.J. Thomson, charge of an electron by Millikan's method, Bohr's theory of Hydrogen atom, Frank & Hertz experiment, electron spin, Quantum number, Pauli's exclusion principle, fine structure of spectral lines, Stern-Gerlack experiment, Selection rule LS & LI coupling for two electrons, Zeeman effect, continuous and characteristic x-ray spectra.

Section -7
Quantum Theory .

Compton effect, Davission and Germer experiment, matter waves, uncertainity principle, Schrodinger's wave equation, significance of wave function (ψ) Eigen values and Eigen function, particle in one-dimentional box. Molecular Physics : Different types of molecular spectra, Raman effect, Laser, Ruby laser and its applications.

Section- 9
Solid State Physics:
Concept of crystal structure Bravias lattice, Crystal planes, Miller indices, Bragg's Law, Free-electron theory of metals, expression for electrical conductivity by Drude model, Sp. Heat of solids, Dulong and Petit's law, Einstein's theory of Sp. Heat of solid Energy bands, intrinsic and extrinsic semiconductors, physics of PN junction, rectifying action, physics of NPN transistor, Solar cells, Hall effect, super conductivity, Meissner effect. Critical magnetic field, Critical temperature, Persistent current and applications of super conductivity.

Section- 10
Relativity

MichelsonMorley experiment, Basic postulates of special theory of relativity, Lorentz transformation, length contraction, time dilation, relativistic variation of mass, Relativistic velocity transformation equation, Einstein's mass energy relation and Minkowski Space.

Pattern of the question paper
PART- A: Objective type questions

Twenty one-mark questions (without internal choice) requiring filling-in the blanks or choosing the correct answer from a multiple choice or giving one-sentence / one-word answers, stating true or false-twenty questions from the entire syllabus for one mark each – 20 marks.

PART- B: Descriptive type questions
Section – 1
Five short notes questions (with internal choice) covering the entire syllabus for four marks each – 20 Marks.
Section - 2
Five questions (with internal choice) from the entire syllabus for twelve marks each – 60 Marks.

VI CHEMISTRY

Duration – 3 Hours, 100 Marks

Section - 1
Atomic Structure and periodic table

Bohr's theory of atomic structure, de Broglie hypothesis. Heisenberg's uncertainty principle, quantum numbers, shapes of s, p, and d orbitals. Pauli exclusion principle, Hunds rule, electronic configuration of elements up to atomic number 30. Classification of elements into s,p,d & f blocks. Atomic radii, ionisation energy, electronaffinity and electronegativity- definition and their variation along a period and in a Group. d and f block elements, Electronic configuration-,oxidation states, colour, magnetic properties, complexation, lanthanide contraction and separation of lanthanides.

Section - 2
Chemical bonding

Ionic bond, characteristics of ionic compounds, factors effecting stability of ionic compounds, lattice energy, Born-Haber cycle: Covalent bond: hybridization of orbitals (sp, Sp^2 and Sp^3), σ and π bonds- general characteristics, polarities of bonds in molecules and dipole moments. Valence bond theory , concept of resonance and resonance energy. Molecular orbital theory (LCAO) method, bonding in H_2, He_2, 0_2, N_2, NO, CO and HF , bond energy and bond strength.

Section –3
Coordination and Bio-inorganic Chemistry

Definition of complex ions, ligands and coordination number, types of ligands. IUPAC nomenclature of coordination compounds. Isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Stability of complexes- stability constant and factors influencing stability. Valence bond and crystal field theories of bonding. Magnetic and spectral properties of complexes. Spectrochemical series. Metal ions in biological systems- essential and non-essential metals, oxygen uptake proteins, haemoglobin and myoglobin and nitrogen fixation.

Section-4
Thermodynamics

Thermodynamic systems, states and processes, work, heat and internal energy: first law of thermodynamics, work done on the systems and heat absorbed in isothermal and adiabatic processes. Energy and enthalpy changes in isothermal and adiabatic processes and their temperature dependence. Limitations of First law. Second law of thermodynamics: entropy as state function, entropy changes with respect to pressure, volume and temperature, entropy changes in reversibe and irreversible systems. Free energy functions, spontaneous process, Carnot cycle, free energy variation with respect to state variables. Criteria for equilibrium, relation between equilibrium constant and thermodynamic quantities.

Section-5
Chemical kinetics, Surface Phenomena and Catalysis
Concentration dependence of rate of reaction, differential and integral equations for first and second order reactions. Parallel, consecutive and chain reactions. Effect of temperature on rate constant. Theories of reaction rates- collision and transition state theories. Surface

phenomena and catalysis. Adsorption: Types, adsorption isotherms- FreutMich and Longmuir. Catalysis: Types and characteristics of catalysis, Catalytic reactions.

Section-6
Electrochemistry

Conductance- specific, molar and equivalent. Oebye-Huckel theory of strong electrolytes. Electrochemical cells- types, Nernst equation for single electrode potentials, reference electrode, Galvanic cells, measurement of e.m.f. of cells, determination of pH and potentiometric titrations. Electrochemical series.

Section-7
Basic organic chemistry

Classification of reagents and reactions:- Electrophiles and nucleophiles. Homolytic and heterolytic fission of covalent bond. Reactive intermediates:- Carbocations, carbanions and free radicals (Generation, stability, reactions and geometry). Substitution, addition, elimination and rearrangement reactions. Electronic effects:- Inductive, mesomeric and hypercongugation effects. Hydrogen bonding in organic molecules and its effects, Mechanism of SN_1, SN_2, E_1 and E_2 reactions. Aromatic hydrocarbons.- Huckle's theory of aromaticity. Mechanism of aromatic electrophilic substitution reactions (Nitration, halogenation, sulphonation and Friedel Craft's alkylation). Influence of meta, ortho and para directing groups.

Section-8
Mechanism and application of reactions

Cannizzaro, Beckmann, Benzoin, Aldol, Hoffinann, Perkin reactions & Arndt-Estert Synthesis.

Section-9
Stereochemistry & Spectroscopy, Optical isomerism

Optical activity, chirality in organic molecules. D, L, and R, S notations. Fischer, Newman and Saw-horse formulae. Enantiomers and diastereomers. Racemization and resolution of racemic mixtures. Geometrical isomers: Geometrical isomerism in maleic & fumeric acids, aldoximes and mixed ketoximes, determination of their configurations. Syn. & anti and E & Z notations. Spectroscopy: Applications of IR, UV -Visible and NMR spectroscopy for structural elucidation of organic compounds.

Section-10
Carbohydrates

Classification, Monosaccharides:-Elucidation of open and ring structures of Glucose and Fructose (Pyranose ring structures) Disaccharides : Elucidation of structures of Sucrose and maltose, Polysaccharides: Structure of Starch and Cellulose. Amino acids and proteins: Definition, classification and synthesis of amino acids. Zwitterion and isoelectric points. Peptide bond, synthesis of polypeptides. Proteins: Classification-Primary & Secondary structures.

Pattern of the question paper

PART- A: Objective type questions

Twenty one-mark questions (without internal choice) requiring filling-in the blanks or choosing the correct answer from a multiple choice or giving one-sentence answers. Twenty questions from the entire syllabus for one mark each – 20 marks.

PART- B: Descriptive type questions

Section – 1
Five short notes questions (with internal choice) covering the entire syllabus for four marks each – 20 Marks.

Section - 2
Five questions (with internal choice) from the entire syllabus for twelve marks each – 60 Marks.

VII   MATHEMATICS

Duration – 3 Hours, 100 Marks

Section-1 - Number theory, calculus and ordinary differential equations

Division algorithm, G.C.D. of two numbers, prime numbers, fundamental theorem of arithmetic. congruences, solving linear Congruences, congruence theorems of Euler, Fermat and Wilson. sequence and series of real numbers, tests of convergence of infinite series- comparison, order, integral, ratio, root and Raabe's tests, summation of binomial, exponential and logarithmic series.   Limits and continuity, differentiability of real functions, successive differentiation, monotonically increasing and decreasing functions, maxima and minima, mean value theorems and taylor's theorem. Functions of two and three variables, continuity, partial derivatives, homogeneous functions.   Euler's equation for homogeneous functions. maxima and minima for two variable functions.   Indefinite integrals and fundamental theorem of calculus, definite integrals and their applications to compute areas of plane regions, volumes of solid revolutions and lengths of arcs.   Double integrals and their application to areas of three dimensional surfaces, triple integrals and their application to volumes of solids.   Ordinary differential equations; definition, order and degree of an ordinary differential equation, Formation of differential equations by a known family of functions. Solving equations of order one and degree one- equations in variable separable form, equations in which homogeneous functions present as coefficients, equations in exact form, linear equations of order one and bernoulli equation, orthogonal trajectories. Higher order equations with constant coefficients- complementary function, particular integral and general solution, solving second order equations by the method of variation of parameters.

Section-2 - Analytic solid geometry, Group theory and Laplace transforms.

Analytic solid geometry : Cartesian, Spherical Polar and Cylindrical Polar Coordinate Systems in Three Dimensional Space, Planes, Straight Lines, Shortest Distance Between Two Skew Lines, Spheres, Cones and Cylinders. Definition and examples of a Group, Subgroup, Cosets and Lagrange's Theorem on finite Groups, Cyclic and Abelien Groups.   Normal Subgroups and Quotient Groups, Group Homomorphism, Isomorphism and Fundamental Theorems of Homomorphism.   Permutation Group Sn and Cycles, Decomposition of Permutations into Disjoint Cycles and Concept of Even and Odd Permutations Definition and Examples of a Ring, Sub Ring, Ideal, Integral Domain and Field.   Laplace Transforms; Definition, concepts of sectionally continuous functions, functions of exponential order and functions of class A. Transforms and inverse transforms of elementary functions. Transforms of derivatives and derivative of transforms, convolution theorem, solving initial value problems by Laplace transform method.

Section–3
Theory of Equations, partial differential equations, vector algebra and calculus

De Moivre's Theorem for a rational index, nth roots of Unity, statement of fundamental theorem of algebra, real and complex roots of a polynomial equation with real coefficients, relations between roots and coefficients, transformations of equations, reciprocal equations, solutions to cubic equations by Cordon's method. Vector algebra, Scalar triple product, Vector triple product, product of four vectors, Reciprocal vectors, Standard vector identities. Scalar and vector fields - gradient of a Scalar field, divergence of a vector field, Laplacian of a Scalar Field, Curl of a Vector Field, Solenoidal and Irrotational Vector Fields, Standard Identities.   Green's theorem in a plane, Stokes theorem and Gauss divergence theorem. Partial differential equations Definition, order and degree of partial differential equations, formation of partial differential equations, equations of the type - $dx/P = dy/Q = dz/R$,

Charpitz method, linear partial differential equations with constant coefficients and their classification into parabolic, hyperbolic and elliptic equations, heat conduction equation, wave equation and Laplace equation.

Section–4 - Linear algebra, vector mechanics and complex analysis

Vector spaces, linear dependence and linear independence of vectors, bases and dimension of a vector space, finite dimensional vector spaces. Matrices, row space, row and column reduction, echelon form and rank of a matrix, solving a system of n linear equations for n unknowns by gauss elimination method. Vector Mechanics; Simple harmonic motion, motion in a plane, projectiles, constrained motion, work and energy, conservation of energy, motion under impulsive forces, Kepler's laws, orbits under central forces. Complex Analysis; Complex numbers and complex plane, conjugate, modulus and argument of complex numbers, Euler's formula, equation of straight line and circles. Complex variables and analytic functions, necessary and sufficient conditions for a function to be analytic, harmonic functions and construction of analytic functions. Complex line integrals, Cauchy's integral theorem, Cauchy's inequality, Liouville's theorem and fundamental theorem of algebra, conformal mapping and bilinear transformations.

Section–5 - Matrices and determinants, linear programming, numerical analysis and finite difference.

Algebra of matrices, transpose of a matrix, symmetric and skew-symmetric matrices, determinant of a square matrix and its properties, singular and non-singular matrices, adjoint and inverse of a nonsingular matrix, characteristic equation and characteristic roots, Caley-Hamilton theorem, solving system of n linear equations for n unknowns by Cramer's rule. Linear programming problems, basic solution, basic feasible solution and optimal solution, graphical method and simplex method of solution, duality. Numerical analysis; Error analysis, solution of algebraic equations- bisection, Regula-Falsi, Secant, Newton-Raphson methods. Finite differences : Definition and properties of Δ, ∇ and E operators and interrelations, Newton-Gregory forward and backward interpolation formulae, Lagrange's interpolation formula for unequal intervals. Numerical differentiation by interpolation formulae, numerical integration by Trapezoidal Rule, Simpson's 1/3rd and 3/8thRules and Weddle Rule. Numerical solutions of IVP for ordinary differential equations by Piccards method, Euler's and Modified Euler's formula and Fourth Order R-K Methods.

Pattern of the question paper

PART- A: Objective type questions
Twenty one-mark questions (without internal choice) requiring filling-in the blanks or choosing the correct answer from a multiple choice or giving one-sentence answers, twenty questions from the entire syllabus for one mark each – 20 marks.

PART- B: Descriptive type questions

Section – 1
Five short questions (with internal choice, requiring derivation of formulae or stating, proving theorems, etc.) covering the entire syllabus for four marks each – 20 Marks.

Section - 2
Five questions to be attempted selecting one from each section (with internal choice) for twelve marks each – 60 Marks.

Section -1
Morphology

Study of the general occurrence, classification, nutrition, structure, reproduction, life cycle and economic importance of Viruses, Bacteria and Cyanobacteria (Nostoc, Gleocapsa, Spirulina, Scytonema); Algae (Spyrogyra, Oedogonium, Chara, Vaucheria, Sargassum, Diatom and Bactracospermum) and; Fungi (Saprolegnia, Albugo, Mucor, Phytophthora, yeast, Pencillium, Xylaria, Puccinia, Pyricularia, Cercospora); General account, structure, nutrition, reproduction and economic importance of Lichens, Bryophytes (Marchantia, Anthoceros, Funuria); Pteridophytes (Rhynia, Psilotum, Lycopodium, Selaginella, Equisetum, Ophioglossum, Osmunda, Pteris, Marsilea) and; Gymnosperms (Cycas, Pinus, Gnetum).

Section -2
Taxonomy

Principles of taxonomy, units of classification, systems of classification, Bentham and Hooker, and Engler and Prantl's systems of classification, Herbarium techniques study (with examples) of Monocotyledons (Poaceae, Arecaceae, Liliaceae, Canaceae, Orchidaceae and Musaseae); Dicotyledons (Amaranthaceae, Annonaceae, Capparidaceae, Fabaceae, Brassicaceae, Rutaceae, Euporbiaceae, Anacardiaceae, Malvaceae, Apiaceae, Myrtaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Verbanaceae, Lamiaceae, Solanaceae, Scorphulariaceae, Acanthaceae, Rubiaceae, Cucurbitiaceae and Asterceae)

Section -3
Economic Botany

Origin, distribution and economic importance of Food crops (rice, ragi, wheat, jowar, Bengal gram and black gram); Oil crops (groundnut, coconut and castor); Beverages (tea, coffee and cocoa); Sugar and starch (sugar cane, tapioca, potato); Spices (cardamom, cloves and cinnamon); Fibre (cotton, coir and jute); Rubber yielding plants (Hevea and Ficus); Timber and pulp (teak, rosewood, bamboo and eucalyptus); Medicinal plants (Ravoulfia, Cinchona, Vinca and Digitallis); Narcotic plants (Tobacco and Opium).

Section -4
Anatomy and Histology

Types and classification of tissues, their structure and function, meristems, organization of the shoot and root apex. Ground tissues; Parenchyma, collenchyma, sclerenchyma, selereids – their position and distribution in plants parts and their significances. Tissue systems – Epidermal, mechanical, vascular, laticiferous their structure and function. Types of vascular bundles. Internal structure. Dicot and monocot root, stem and leaf. Secondary growth in dicot stem and root.

Section -5
Embryology

Microsporogenesis and male gametophyte. Megasporogenesis and female gametophyte. Double fertilization, embryogenesis, endosperm formation, types of endosperm – nuclear, cellular and helobial. Flower morphology, types of pollination, contrivances, agents of pollination.

Section -6
Physiology and Biochemistry

Osmosis, absorption and translocation of solutes and minerals, ascent of sap, theories of ascent of sap. Factors affecting water relationship in plants. Types of transpiration, signifcance, mechanism of stomatal opening, factors affecting transpiration, guttation. Mineral salt absorption : Soil solution, availability of mineral salts, hydrophonics, mechanism of salt absorption, passive and active absorption of salts by land plants. Mineral nutrition – role of micro and macro elements. Photosynthesis – mechanism of photosynthesis, light and dark reaction, pigments involved in photosynthesis, electron transport system, structure of chloroplast, C3 and C4 plants, factors affecting photosynthesis, Respiration – Definition and significance of respiration, types of respiration, mechanism of respiration, enzymes of respiration, respiratory quotents, electron transport chain and oxidative phosphorylation, ATP account, factors affecting respiration. Nitrogen metabolism, nitrogen fixation. Plants movements, plant growth, flowering, harmones and their application. Physiology of flowering : Photoperiodism – Short day, long day and photoneutral plants, photoperiodic stimulus, induction and response, practical application of photoperiodissm. Vernalisation – brief account of vernalisation and its practical application in agriculture. Dormancy; Introduction, bud dormancy – induction and removal of bud dormancy, seed dormancy, seed viability, method to breaking dormancy.

Section -7
Cytology and Genetics

Structure of prokaryotic and eukaryotic cell, cell wall, plasma membrane, endoplasmic reticulum, lysosomes, plastids, ribosomes, golgi complex, mitochondria, living and non-living inclusions. The nucleus, nuclear membrane and nucleolus. Chromosome – chromosome morphology, Nucleosome; sub unit of chromatin and solenoid model of chromosome. Fine structure of genes, genetic code and protein synthesis. Plasmids, a brief study of polypoidy. Cell division – mitosis and meiosis and their significance. Mutation, types and usage, factors responsible for mutation. Fine structure of the gene : Gene concept (Cistron, recon and muton), plasmids, transposons, Gene expression in prokaryotes – Lac operon, Watson and Crick model of DNA, DNA replication, types of RNA, Genetic code and protein synthesis. Interaction of genes : concept, epistasis, recessive epistasis / supplementary genes, complimentary genes, dominant epistasis, duplicate genes. Sex chromosomes and Sex determination in plants, sex linked inheritance. Mendelism : Mendel's work mono and dihybrid crosses, Mendel's laws of inheritance. Back cross and test cross. Linkage : coupling and repulsion. Linkage and crossing over with examples.

Section -8
Plant Pathology

Symptom, causative agent, transmission, control. Measures of the following disease; Bunchy top disease of Banana, Citrus canker, Fruit rot of Arecanut – Koleroga, Blast of Rice, Wheat rust and Tikka disease of Ground nut.

Section -9
Ecology, Environment and Biodiversity

Introduction : aim and scope, ecological factors – edaphic, climatic and biotic, types of ecosystem, food chain and food web. Plant communities. Hydrophytes, Xerophytes, Halophytes and Epiphytes. Plant succession – Xerosere and Hydrosere. Plant adaptations – Ecological adaptations (morphological and anatomical) of hydrophytes, mesophytes, xerophytes, epiphytes and halophytes. Environmental pollution – Air and water pollution and their impact on vegetation, pollution control, green house effect, acid rains.

Section -10
Conservation Ecology

Conservation of nature and natural resources, soil water, forest, threatened plants and animals, endemic plants of India and their conservation. Bio-diversity, hot spots of India, Afforestation methods, soil erosion and soil conservation methods, water land management, monoculture and its effect, wild life management, national parks, sanctuaries and bioreserves, farm forestry, glass house/green house cultivation of plants.

Section-11
Phytogeography

A brief account of phytogeographical regions of India with special reference to vegetation of Karnataka.

Pattern of the Question paper

PART-A: Objective type questions

Twenty, one mark questions (without internal choice) requiring filling in the blanks or choosing the correct answer from a multiple choice or giving one sentence answers-twenty questions from the entire syllabus for one mark each-20 marks.

PART-B: Descriptive type questions

Section-1

Five short notes questions(with internal choice) covering the entire syllabus for four marks each - 20 marks.

Section-2

Five questions (with internal choice) covering the entire syllabus for twelve marks each –60 Marks

IX ZOOLOGY

Duration-3 hours, 100 marks

Section -1
Non-chordata and chordata

General characters and classification upto class among non-chordata and chordata with suitable examples. Digestive, locomotory and excretory systems in invertebrates. Comparative anatomy of circulatory .Urinogenital and nervous systems in vertebrates.

Section -2
Physiology and biochemisiry ;

Respiration, muscle and nerve physiology in mammals. Thermoregulation, excretion, osmoregulation and physiology of reproduction(vertebrates)Structure, classification and function of carbohydrates, proteins, lipids, vitamins, nucleic acids and enzymes

Section-3
Cell biology, genetics and evolution

Ultrastructure of cell organelles such as plasma membrane, Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi complex, Lysosomes, Ribosomes Nucleus including Chromosomes, Cell cycle, mitosis, meiosis, Gametogenesis , Fertilization. Principles of Mendelian inheritance, interaction of genes, Sex linkage, quantitative inheritance, Gene structure, function and regulation, Sex determination in Drosophila and man. Lamarkism, Darwinism, evidences of organic evolution, modern concept of evolution, evolution of man and horse Colouration of mimicry.

Section -4
Environmental, developmental and wild life biology

Concept of ecosystem abiotic and biotic factors, population attributes, food chain and food web,ecological pyramids, sources and biological effects of pollution of Air,Water and soil and their control measures. Types of eggs, cleavage .patterns, Gastrulation, fate maps, placenta,insect and amphibian metamorphosis, hormones in development and differentiation, in-vitro fertilization (IVF), sperm bank, surrogate mother, cloning, Management of wild-life habitat, national parks, sanctuaries, zoos, Project Tiger, Wildlife policy and legislation.

Pattern of the Question Paper

PART-A: Objective type questions

Twenty, one mark questions (with no internal choice) requiring filling-in the blanks or choosing the correct answer from a multiple choice or giving one sentence answers - twenty questions from the entire syllabus for four mark each -20 marks

PART -B: Descriptive type questions

Section -1
Five short. notes question.(with internal choice) covering the entire syllabus for four marks each -20 marks.

Section -2
Three questions to be attempted (with internal choice)covering the entire syllabus for twenty marks each- 60. marks

X - AGRICULTURE
Duration – 3 Hours, 100 Marks

Scope and Coverage

Section – 1
Agriculture and natural resources, agroclimatic zones and production of crops.

Ecology and conservation, Natural resources of land, water bio-diversity including flora & fauna in India, Vegetation and forest types, current status. Propagation and scope of agroforestry, social forestry, wood lots. Cropping patterns in different agroclimatic zones of Karnataka; changes due to environment, imitation advances in crop production technology & net forces. Green revolution, food security and organic farming. Degradation of soil and water resources, hazards due to chemical forces.

Section – 2
Agronomy and Soils.

Soils – physical, chemical and biological properties, soil formation, soil classification, mineral and organic constraints, plant oxidants, soil carbon and nitrogen, humus formation, major and micro nutrients; N fixation; P fixation; Integrated Nutrient Management; Problem soils, their reclamation and management; soil conservation, dry land technologies for stabilising rain fed crop production; Watershed development. Agronomic concepts and practices; tillage, sowing of crops; seed and its importance; weeds and their ecology, control measures, integrated weed management; Irrigation methods and water use efficiency; soil fertility and maintenance – green manuring, composting, vermicomposting, Biofertilisers; Crop rotations; Concepts of multiple cropping, inter and relax croppings, multistorey cropping; Harvest and post harvest technologies. Package of practices for cereals, pulses, oil seeds, fiber, fodder, sugar and commercial crops of Kharif, Rabi and summer seasons; pastures and silvipastures.

Section – 3
Plant breeding and genetics

Laws of heredity, plant breeding and genetics; high yielding varieties, genetically modified crops, crop genetic resources; polyploidy euploid and ancuploids. mutation – micro and macro – and their role in crop improvement. variation, components of variation. Heritability, sterility and incompatibility – classification and application in crop improvement. Methods of crop improvement, hybrid vigour and its exploitation, back cross method of breeding, breeding for disease and past resistance; Role of interspecific and intergeneric hybridisation. Role of biotechnology in plant breeding. Seed technology, seed production, processing and marketing. Intellectual property rights. Physiology and its importance – physiological processes; Drought and drought tolerance; photosynthesis, major pathways of photosynthesis; photoperiodism and vernalisation. Plant growth regulators, harmones. Physiology of seed germination & dormancy. Carbohydrates, protein and fat metabolism.

Section – 4
Horticulture

Major horticultural crops – fruits, vegetables, flowers – cultivation, processing and preservation techniques. Human nutrition. Land scaping, gardens lawns, ornamentals; export and marketing problems. Diseases and pests of all field and horticultural crops; causes and control; Alternate methods of control; integrated pest management; storage pests and diseases.

Section – 5
Agricultural extension, farm management and food policy

Agricultural extension, methods and programme. Transfer of technology projects and other extension programmes. Farm Management; Farm planting, complete and partial budgetting; significance of natural resource economics in farm management; Marketing and pricing of agricultural inputs and outputs; economics of farming enterprises – agriculture, dairying, poultry processed foods and farmers poverty and prosperity. Valuation of natural resources & services. Food policy, poverty and poverty alleviation programme, Rural development programmes; World Trade Organisation; Intellectual Property Rights.

Pattern of the question paper
PART- A: Objective type questions

Twenty, one-mark questions (without internal choice) requiring filling-in the blanks or choosing the correct answer from a multiple choice or giving one-sentence answers, twenty questions from the entire syllabus for one mark each – 20 marks.

PART- B: Descriptive type questions

Section – 1
Five short notes questions (with internal choice) covering the entire syllabus for four marks each – 20 Marks.

Section - 2
Five questions (with internal choice) from the entire syllabus for twelve marks each – 60 Marks.

XI – CIVIL ENGINEERING

Duration – 3 Hours, 100 Marks

Section – 1

Engineering Mechanics

Resultant and equilibrient determination of coplanar concurrent and non-concurrent force system. Determination of reaction for simple statically determinate beams. Centroid and second moment areas of Plain figures and built up reactions. Friction fundamentals and application on lodder friction. Rectilinear motion with constant acceleration. Projectiles, De-alemberts Principles. Strength of Materials : stress and strain in bars of uniform and varying cross section made up of single material. Application on elastic comtants (No derivation). Stresses in thick and thin cylinders. Share force and bending moment for statically determinate beams subjected to transverce load only(No couples) Euler's and Rainkains formulae for aceelary loaded columns. Structural Analysis: Influence lines for reaction, shareforce and bending moment in beams and their use in analysis for rolling loads. Three finzed arches, Equilibrium of loaded card and cables. Method of computing deflections of statically determinate beams and frames by moment area method and conjugate beam method. Steel Structures: Analysis and design of structural fasteners like riveted connections, high strength friction grip bolted connection, fillet and but welded connection. Design of axillary loaded tension members. Design of angle struts built up compression member lacing and batterns subjected to axial load.

Section-2
Water Supply Engineering

Water demand calculation, methods of population forecasting, demand variation and its effects on water supply component . Study of different physical, chemical and biological characteristics to assess quality of water . BIS-standards for drinking water, System of supply and methods of distribution and layouts. Pipe appurtenances. Purpose and operational concept s of water treatment units (designs excluded). Waste Weater Engineering: System of sanitation of sewage disposal Estimation of dry and wet weather flows. Time of concentration hydraulic design of circular sewers-running full and partial flow. Sewer appurtenaces and house drainage connections. Analysis of sewage , Purpose and operational concepts of water treatment units(design excluded). Fluid Mechanics: Fluid properties and classification. Fluid pressure and its measurement. Simple and differential manometers and mechanical gauges. Fluid friction in pipes. Friction factors for commercial pipes. Major and minor loses. Application of Bernoulie's equation, Pitot tubes, ventury meter and orifice meter. Classification description and working principles of single stage centrifugal pumps including concept of priming. Hydrology and Water Resources Engineering: Types , Forms and Measurements of Precipitation system and methods of irrigation . Quantity and quality requirements of water for different crops, General Principles of design of gravity and earthen dams (excluding numerical problem) Types, alignment, maintenance and design principles of cannels

Section-3
Highway Engineering: Principles of Highway : Planning, Highway alignments, and cross section. Classification of roads and their construction, Surface and subsurface drainage of roads. Traffic forecasting techniques, origin and destination survey, Highway capacity, Markings, Sign, Signals, Street lighting, Railway Engineering , Rail fastenings, Balast, Sleepers, Points, Crossings and Gauges. Signals and interlocking creep of rail, rulling gradient, tract resistance and tractive effort. Super elevation construction and maintenance of permanent ways. Relaying of truct. Surveying-Basic : Compass surveying, use of prismatic compass. Field work, Booking and plotting by graphical methods, errors and precaution,

Principles of leveling , types reduction of levels and booking of staff readings, Errors in leveling and precautions. Principles of hand levels, clino-meters, Ghat trancers, box-sextant and Planimeters Surveying-Advances-Fundamentals of theodalite and tachiometric survey, Heights and distances. Counters and their applications, setting of simples, compound and vertical curves.

Section-4
Construction Engineering

Coarse, rubble and ashlar stone masonry. Bonds in brick work, hallow block construction , Damp proof construction pointing, plastering and painting, Different types of doors and windows with fixtures and fittings-Function of lintels, chajjas, canopy and balcony. Types of stairs and their suitability. Engineering Materials: Classification and qualities of good building stones. Types and Indian standard classification of Bricks. Different types setting times and strength of cement Ingredients, Proportions properties and uses of cement mortar. Concrete importance of water cement ratio , strength, ingredients including ad mixtures, workability testing for strength elasticity. Construction Management: Construction activity, schedules, job layout, bar charts, organization of contract, project control and supervision cost reduction measures.   CPM and PERT analysis, float times, cashing of activities construction of network for cost optimization updating, Cost analysis and resource allocations . Geotechnical Engineering : Index properties of soil and their determination. Particle size distribution –sieve analysis and consistency of soils. Atterberg and hydromatic limits and indices. Classification of soils-Necessity classification based on particle size-HRB, MIT, ISI and International textural classification PRA or HRB classification system, unified And ISI classification , Concept and factors affecting shear strength –Mohar, coulomb theory, Measurement of shear parameter.. Types of foundations, selection criteria, bearing capacity , settlement, laboratory and field tents.

Pattern of the question paper

PART-A Objective type questions

Twenty, one mark questions(without internal choice) requiring filling in the blanks or choosing the correct answer from a multiple choice or giving one sentence answers-twenty questions from the entire syllabus for one mark each - 20 marks.

PART-B Descriptive type questions

Four questions (with internal choice) from the entire syllabus for twenty marks each - 80 marks.

XII - FORESTRY -I
Duration – 3 Hours, 100 Marks

Section-1
General Silviculture

Biotic and abiotic components of forest eco-system, forest community concepts, forest productivity, nutrient cycling and water relations, ecological succession and climax, forest types of India, identification of species, composition and associations, principles and establishment of herbaria and arboreta. General silvicultural principles, locality factors influencing vegetation, natural and artificial regeneration of forests, methods of propagation, forest nursery techniques, nursery beds, poly bags and maintenance, grading and hardening of seedlings, establishment operation, tending operations, weeding, cleaning, thinning, improvement felling and climber cutting.

Section-2
Silvicultural systems and silviculture of trees.

Clear felling, shelter wood, selection, accessory, coppice and conversion systems, Choice of species, establishment and management of stands, enrichment   methods, technical constraints, intensive mechanized methods. Traditional and recent advance in tropical silvicultural research and practices. Silviculture of some of the economically important species such as *Acacia nilotica, Acacia auriculiformis, Albizzia lebeck, Anogeissus latifolia, Azadirachta indica, Bambusa bambos, Dendrocalamus strictus, Bombax ceiba, Casuarina equisetifolia, Dalbergia latifolia, Emblica officinalis, Eucalyptus hybrid, Gmelina arborea, Hardwickia binata, Lagaerstroemia lanceolata, Pterocarpus marsupium, Prosopis juliflora, Santalum album, Tectona grandis, Terminalia tomentosa, Terminalia arjuna, Terminalia paniculata, Tamarindus indica* and *Xylia xylocarpa*.

Section-3
Agro forestry and social forestry

Agro forestry scope and necessity, tree-crop interaction, choice of species, classification of agro forestry systems, Agro forestry systems under different agro-ecological zones of Karnataka, role of multipurpose trees and NTFP species, in food, fodder and fuel security. Social / Urban Forestry, objectives, scope, necessity and people's participation. Farm forestry, farm wood lots, dry land and wetland forestry. High density plantations.

Section-4
Soil conservation and watershed management

Forest soils, classification, soil formation, physical, chemical and biological properties, Soil conservation, definition, causes for erosion, agencies of erosion, wind and water erosion, conservation and reclamation of problematic soils and waste lands, role of forests in conserving soils. Maintenance and build up of soil organic matter, Role of micro-organisms in ameliorating soils, VAM fungi, watershed management, concept of watershed, forest hydrology, watershed development for torrent control, river channel stabilization, avalanche and landslide controls, rehabilitation of degraded areas, hilly and mountain   areas, integrated watershed management, water-harvesting and conservation, ground water recharge and watershed management.

Section-5
Tree improvement

General concepts of tree improvement, methods and techniques, variation in natural stands and its use. Species and provenance selection, introduction of exotics. Seed production areas and seed orchards, establishment, evaluation, maintenance and utility. Progeny testing, genetic improvement of natural forest trees and stands.. Selection procedure and techniques in tree improvement. Forest genetic resources and gene conservation. *In-situ* and *ex-situ* techniques. Modern propagation techniques, seed certification.

Pattern of the question paper

PART-A Objective type questions

Twenty questions (without internal choice) which includes filling the blanks or choosing the correct answer from a multiple choice or giving one sentence answers. Twenty questions from the entire syllabus of one mark each -20 marks.

PART-B Descriptive type questions

Section 1
Five short notes questions (with internal choice) covering the entire syllabus for four marks each-20 marks

Section-2
Five questions (with internal choice) from the entire syllabus for twelve marks each-60 Marks.

XIII - FORESTRY-II
Duration – 3 Hours, 100 Marks

Section-1
Forest Management

Objectives, principles and techniques of forest management, units of administration and management, Forest stands, structure and dynamics, principle of sustained yield, normal forest , rotation, growing stock assessment, yield regulation, management of forest plantations, commercial forests, working plans, characteristics and methods of preparation of working plans, their role in scientific management, conservation of nature , bio-diversity and other dimensions, annual plan and its operation, JFM, principles, objectives , methodology, scope , benefits and role of NGO's and formation of JFPM Village Forest Committees.

Section-2
Forest mensuration and remote sensing

Methods and instruments used for measuring diameter, girth, height, age, increment and volume of trees, tree form factor, volume estimation of stands, current annual and mean-annual increments, sampling methods and sample plots, yield calculation, yield and stand tables, preparation and utility of yield tables site quality assessment and Remote sensing - Principles, devices and applications in forestry, forest cover monitoring geographic information systems for forest management.

Section-3
Forest economics and legislation

Forest economics, fundamental principles, cost-benefit analyses, estimation of demand and supply, role of private sector, co-operatives and corporate financing of forestry, valuation of forest goods and services, constraints in marketing of NTFPs. Legislation, history of forest development, National forest policies of 1894, 1952 and 1988, forest policy and issues related to land use, timber and non-timber products, institutional and structural changes. Forest laws; necessity and general principles, Indian Forest Act 1927, Karnataka Forest Act 1963, Forest (Conservation) Act 1980, Wildlife Preservation Act 1972, and their amendments, the Environment (Protection) Act, 1986.

Section-4
Forest resources and utilization

Environmentally sound forest harvesting practices, logging and extraction techniques and principles, transportation system, storage and sale of forest produce, non-timber forest produce (NTFPs), definition and scope, collection processing and disposal of gums, resins, oleoresins, fibres, oil seeds nuts, rubber, canes, bamboos, medicinal plants, charcoal, lac and shallac, katha and beedi leaves, Need and importance of wood seasoning and preservation, general principles and methods of seasoning, composites and improved wood; properties, manufacturing processes and uses.   Pulp; paper and rayon, present position of supply of raw material to industry, wood substitutes, utilization of plantation wood.

Section-5
Forest protection

Necessity and limitation, agencies responsible for destruction of forests-man, domestic animals, wild animals and environment factors, preventive and curative measures. Anthropogenic factors responsible for destruction of forests, shifting cultivation, mining, forest fire, poaching, defective management, encroachment, illicit felling and their control . Forest fires , types, damage, dynamics and its control. Pressure of grazing and browsing on forests, damage and control measures, rotational and controlled grazing, effect of wild animals on forest regeneration, important pests and diseases of nursery and plantation. Integrated pest and disease management.

Section-6
Environment and bio-diversity conservation

Environment components and importance, impact of deforestation, forest fires and various human activities like mining , construction and developmental projects, population growth on environment and biodiversity . Pollution, types impact and control measures, global warming, green house effects, ozone layer depletion and acid rain their characteristic features, effect and control. Role of trees and forests in environmental conservation, control and prevention of air, water and noise pollution. Environmental monitoring, Environmental impact assessment. Conservation, Principles of conservation biology. Biodiversity, concept, levels and values. Strategies and methods of biodiversity conservation with special reference to protected areas. Wildlife of Karnataka, management and conservation, eco-tourism. Tribes and traditional knowledge. Conservation of forest ecosystems and sustainable development.

Pattern of the question paper

PART-A Objective type questions

Twenty questions (without internal choice) which includes filling in the blanks or choosing the correct answer from a multiple choice or giving one sentence answers. Twenty questions from the entire syllabus for one mark each - 20 marks

PART-B : Descriptive type questions

Section-1
Five short notes questions (with internal choice) covering the entire syllabus for four marks each - 20 marks

Section-2
Five questions (with internal choice) from the entire syllabus for twelve marks each – 60 Marks.

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