

**Karnataka Examinations Authority, Bengaluru - 560012****PGCET: 2024 – 25****Number of MCQ questions for PGCET is 100. Each question carry one mark.****Syllabus for PGCET in Environmental Engineering****(1) Engineering Mathematics**

(i) Linear Algebra: Matrices and determinants, rank of matrix, systems of linear equations, Eigen values and Eigen vectors.

(ii) Calculus: Limit, Continuity and differentiability, Partial derivatives, test for convergence, Fourier series.

(iii) Vector Calculus: Gradient, divergent and curl, line, surface and volume integrals. Stokes theorem, problems related to Gauss's and Green's theorem.

(iv) Differential Equations: Linear and nonlinear first order ODEs, higher order linear ODEs with constant coefficients, Cauchy's and Euler's equations.

(v) Partial Differential Equations: PDEs, formation of PDEs, solution of PDE by direct integration and separation of variables. Heat and wave equations.

(vi) Transforms: Laplace transforms, Fourier transform and Z – transform.

(vii) Probability and statistics: Mean, median, mode and standard deviation. Random variables, Poisson normal and binomial distributions, correlation and regression analysis.

(viii) Numerical Methods: Solutions of linear and nonlinear algebraic equations, integration of trapezoidal and Simpson's rule, Numerical solutions of ODEs.

**(2) C Programming for problem solving**

(i) Overview of C: Basic structure of C program, executing a C program, variable and data types, operators and expressions. Managing input and output operations, conditional branching and loops. Example programs. Finding roots of quadratic equation, computation of binomial coefficients, plotting of Pascal's triangle.

(ii) Arrays: Arrays (1D, 2D), character arrays and strings, basic algorithms, searching and sorting algorithms (linear search, bubble sort and selection sort).

**(3) Technical English**

(i) Introduction Listening Skills and Phonetics: Introduction to phonetics, sounds mispronounced, silent and non-silent letters, Homophones and homonyms, aspiration, pronunciation of "The" words ending with age. Use of articles – indefinite and definite articles.

(ii) Identifying Common Errors in writing and speaking English: Subject verb agreement (concord rules with exercises), common errors in subject verb agreement, noun-pronoun agreement. Adjective, adverb, verb, sequence of tenses, misplaced modifiers, Articles and prepositions, common errors in conjunctions. Gender, singular and plural.

**(4) Environmental Chemistry, Biology and Ecology**

Chemistry: Basic concepts of physical chemistry - Osmosis, Dialysis, Adsorption, Pollution Parameters - pH, COD, BOD, DO, TOC, Nitrogen, Fluoride, Sanitary Significance of Sulphate, Nitrates and Phosphates.

**(5) Microbiology**

Plant kingdom, Animal kingdom, Morphology and Growth of Bacteria, Air, Water and Soil, Microbiology, Virology.

**(6)Ecology**

Ecosystem concepts, Food Chain and Food Web. Energy Flow in Ecosystem -Lotic and Lentic Systems, Eutrophication of Lakes. Population Growth Forms, Carrying Capacity, quantitative Ecology, Concept of Ecosystem.

**(7)Environmental Fluid Mechanics and Water Resources Engineering**

Fluid properties and classifications, Newton's Law of Viscosity, Fluid Pressure and its measurements; Hydrostatics, Kinematics of Fluids, Bernoulli's equation, Momentum equation; Flow through Pipes - Darcy's equation, Friction factors, Pipes in Series, Parallel and equivalent. pipe, minor losses; Flow measurements - Orifices, Mouthpieces, Notches, and Weirs; Pumps - Types, working and problems; Quantitative and Qualitative Hydrologic Cycle, Precipitation and Runoff Estimation. Unit Hydrographs, mass diagrams for computing storage capacity, stream flow measurement; Groundwater Definitions, type of Aquifers; Open and Tube wells - type. Yield estimation; artificial recharge, water conservation and Reuse, Soil conservation, Economic aspects of water resource planning.

**(8)Water Supply and Treatment**

Drinking and Industrial Water Quality Standards; Water Quantity based on various demands; Types of intakes, raising main economics, Pumps in series and parallel, Hazen William Equations, Types of reservoirs, Preventive maintenance, regional water supply system; Physico-chemical and Bacteriological characterization of water - surface and sub-surface; Aeration, coagulation and Flocculation, Sedimentation, Filtration -slow rapid and pressure; Hardness and colour removal; Disinfection process - Mode, rate and factors; Corrosion and corrosion control; Operation and Maintenance of water treatment system.

**(9)Wastewater and Treatment**

Quantity of Domestic Wastewater, characteristic wastewater, Disposal of Sullago water in rural areas; Classification of Wastewater Treatment Techniques - Unit operations and process; Screening, Grit Chamber, primary, sedimentation; Biological units: Suspended and fixed growth system, Aerobic and Anaerobic systems, activated sludge process, Trickling filters, RBC, Bio-filter, Secondary sedimentation tank. Stabilization ponds - aerobic, facultative and Anaerobic Lagoons, Septic tanks, digesters, sludge drying beds; Industrial Wastewater Survey; Variation in Quantity and Quality of Industrial wastewater; Guidelines for discharge of Industrial Effluent on land into Municipal Sewers and Natural water; Joint treatment, volume reduction, strength reduction, equalization neutralization and proportioning; Estimation of process kinetic parameters; Origin, characteristics and treatment of cane sugar industry, dairy, distilleries and pharmaceuticals; Wastewater reuse and waste recovery from different industries.

**(10)Solid and Hazardous Wastes Management**

Sources, Composition and properties of Municipal Solid Wastes, Solid Waste Generation, storage and processing at source; Landfill -Classifications, types, control of gases .and leachates, preliminary design of landfills; Separation, Transformation and recycling - size reduction, density separation; Thermal processing - combustion, pyrolysis, gasification, energy recovery; Composting Aerobic and Anaerobic digestion and energy production; Incineration - Types, processes, heat recovery, incineration products; Definition, sources and classification of Hazardous waste; Characterization of Hazardous Waste - Ignitability, Corrosivity, Reactivity, Toxicity, Quantification, Waste Minimization; Toxicology - Toxic effects, Carcinogens, ecotoxicology, Toxicology Assessment; Physico-chemical and

Biological treatment - Air stripping, Soil vapour extraction, carbon absorption, steam stripping, stabilization and solidification. Slurry phase and solid phase treatment. Thermal methods- combustion, liquid injection; Land disposal and site remediation, monitoring of disposal sites.

### **(11) Atmospheric Pollution and Control**

Atmospheric structure and composition, Air pollution episodes; Sources and classification of air. pollutants - Natural and anthropogenic, primary and secondary pollutants. Properties of major air pollutants along with sources and sinks -particulate and gases, photochemical air pollutants, air pollution due to automobiles; Air pollution effects on human health and welfare, vegetation, animals, materials and structure/ monuments, visibility problem, acid rain, greenhouse effect Ozone depletion and heat island effect; Measurement of air pollutants-Measurement of gaseous and particulate pollutants, sample train, air pollution indices and. index; Air pollution Meteorology - scales, factors like heat, solar radiation, temperature, lapse rate, wind, humidity, precipitation, mixing height, pressure atmospheric stability conditions, wind velocity by profile, wind rose diagram; Atmospheric dispersion of stack effects - Plume rise, effective stack height, plume rise formulations, Gaussian dispersion coefficients, ground level concentration; Air pollution control equipment - setting chambers, inertial separators, cyclones, fabric filters, scrubbers, ESP. Control of gaseous pollutants - adsorption, absorption, combustion and condensation.

### **(12) Environmental Impact Assessment**

Introduction - Rapid and comprehensive EIA, Need of EIA states. Baseline data. Hierarchy in EIA, Statutory requirements of EIA: Advantages and Limitation of ETA, Step-by step Procedure for conducting EIA; Objective and scope of EIA; Environmental attributes, Public participation in EIA. Environmental and Disaster Management Plans; Project Activities - Attribute, Activity relationships, Matrices and BEES; Impact Quantifications - Hazardous Waste Dumpsites, Sanitary landfilling; EIA of infrastructural Projects - Highways, Airports, Water supply and Sanitation, Wastewater treatment.

