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4) ENVIRONMENTAL ENGINEERING

Syllabus & Model Question taper

Syllabus

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.

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

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.

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 Hydvologic Cycle, Precipitation and Runoff Estimation. Unit Hydrograpbs, 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.

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. .

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, Biofilter, Secondary sedimentation tank. Stabilization ponds - aerobic, facultative and Anaerobic Lagoons, Septic tanks, digesters, sludge drying beds; Industrial Wastewater Survey; Variation inQuantity 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, diary, distilleries and pharmaceuticals; Wastewater reuse and waste recovery from different industries.

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 - Aerobicand Anaerobic digestion and energy production; Incineration - Types, processes, heat recovery, incineration products; Definition, sources and classification of Hazardous waste; Characterization of Harardous Waste - Ignitability, Corrosivity, Reactivity, Toxicity, Quantification, Waste Minimization; Toxicology - Toxic effects, Carcinogens, Ecotoxicoiogy, Toxicology Assessment; Physico-chemical and Biological treatment - Air stripping, Soil vapor 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.

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, green house effect Ozone depletion and heat island effect; Measurement of air pollutants-Measurement of gaseous and particulate pollutants, sample train, air pollution indicesand index; Air pollution Meterology - scales, factors like heat, solar radiation,temperature, lapse rate, wind, humidity, precipitation, mixing height, pressureatmospheric stability conditions, wind velocity by profile, windrose

diagram;Atmospheric dispersion of stack effects - Plume rise, effective stack height, plume riseformulations, gaussian dispersion coefficients, ground level concentration; Air pollutioncontrol equipments - setting chambers, inertial separators, cyclones, fabric filters,scrubbers, ESP. Control of gaseous pollutants - adsorption, absorption, combustion andcondensation.

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 EIA, Step-bystepProceudre for conducting EIA; Objective and scope of EIA; Environmental attributes, Public participation in EIA. Environmentaland 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;

Model Question Paper

PART - I

Each question carries One Mark 50 x 1 = 50 Marks

1) Sugar Industry effluent isgenerally referred as

(a) High Strength Organic waste (b) Medium Strength organic waste

(c) Low strength Organic waste (d) None

2) Sterilization of water kills

(a) All microorganisms (b) Pathogens only

(c) Beneficial microorganisms only (d) None

3) Water dispersed in air system is used in

(a) Wastewater Treatment (b) Water Treatment

(c) Solid Waste Treatment (d) Hazardous Waste Treatment

4) Wind: speed and direction are represented by:

(a)Gaussian Plume (b)Wind mill (c) Windrose Diagram (d)None

5) Instream standards refer to

(a) Effluent Discharge Standards (b) Raw Wastewater Characteristics

(c) Receiving Stream Standards (d) None

PART-II

Each Question carries Two Marks 25 x 2 = 50 Marks

1) Adsorption process is a

a) physical phenomenon b) physico-chemical phenomenon

c) biological phenomenon d) chemical phenomenon .

2) Typical density of food wastes in solid wastes is

a) 300 kg /m^3 b)130kg/m^3

c)195kg/m^3 d)290kg/m^3

3) Settling velocity of a particle in a sedimentation tank is determined using

a) Chezy's equation b) Hazen-William's equation

c) Manning's equation (d) Newton's equation

4) Ionization constants for solutions of weak acids and bases -are expressed in interns of

a)pH b)p(x) c)pOH d) None

5) The relationship between Chlorine concentration and contact time is expressed by

a)C=tk b) t=Ck c)k=Ct d)C^ntp=k