S Y L L A B U S
(Bachelor Degree Standard)

Screening Test (OMR based Objective Type) for recruitment to the post of Assistant Engineer (Civil/Mechanical/Electrical/Chemical) under Public Health Engineering Department

(Advt. No. 28/2023 dated 31.10.2023)

PAPER-II
Chemical Engineering
(Multiple Choice Objective Type Questions)

Full Marks: **100 Marks**   **Time: 2-00 hours**

- ➢ CEMENT - Types, Portland cement and special types of cement
- ➢ PROCESSES AND PROCESS VARIABLES: mass and volume, mole and molecular weight, choosing a basis, flow rate, chemical composition, density and specific gravity, concentration, pressure temperature
- ➢ PROPERTIES AND CORROSION OF MATERIAL: Electrical and magnetic properties of materials- Chemical, thermal and technological properties of materials - corrosion, theories of corrosion –control and prevention of corrosion.
- ➢ METALS: Engineering materials - ferrous metals - Iron and steel, Iron- carbon equilibrium diagram. Non-ferrous metals and alloys - Aluminium, copper, zinc, lead, nickel and their alloys with special reference to the application in chemical industries.
- ➢ FLUID FLOW PHENOMENA: Velocity field, laminar flow, velocity gradient and rate of shear, Eddie viscosity, viscosity and momentum flux, shear stress field, Newtonian and non- Newtonian fluids, Binghham model, ostwald-de Waele model of non-Newtonian fluid, turbulent flow, Reynold's experiments, flow in boundary layer, laminar and turbulent flow in boundary layer, transition from laminar to turbulent flow –Reynold's number, boundary layer separation and wake formation.
- ➢ BASIC EQUATION OF FLUID FLOW : Stream lines and stream tubes, average velocity, mass velocity, integral equation of flow- Euler's equation of motion, momentum equation for one dimensional flow under steady state condition, the Bernoulli's equation, its application to pumps, blowers, turbines etc.

➢ FLOW OF INCOMPRESSIBLE FLUID IN CONDUITS:Flow ofincompressible fluids in pipes, boundary layer formation in straight tube,laminar flow of Newtonian fluids, Hagen- Poisseuille equation, laminar flow of non-Newtonian fluids, velocity distribution for turbulent flow, averagevelocity, relation between maximum and average velocity, application ofdimensional analysis to fluid flow problems friction factor, piperoughness, loss of head due to friction, bends, fittings etc.

➢ SEDIMENTATION: Gravitational sedimentation- Fine suspensions – Coarse suspensions - Solids flux in batch sedimentation - The Kynchtheory of sedimentation - thickner, Centrifugal separation - behavior of liquids in centrifuge basket fluid pressure - sedimentation in acentrifugal field - separation of two immiscible liquids – centrifugalequipment.

FILTRATION: The theory of filtration - relation between thickness of cakeand volume of filtrate-flow of liquid through the cloth-flow of filtratethrough the cloth and cake combined, compressible filter cakes, Filtration practice, The filter medium-blocking filtration, effect of particlesedimentation on filtration-delayed cake filtration-preliminary treatmentof slurries before filtration-washing of filter cake, Filtration equipment,Filtration in a centrifuge, Filtration calculations.

➢ MIXING AND AGITATION: Agitation of liquids - Purpose of agitation-agitationequipment-Impellers-Flow patterns in agitation vesselscirculationrate-velocity gradients in agitated vessels-power correlationsfor specific impellers-effect of system geometry-calculation of powerconsumption.

➢ **WATER POLLUTION** :
  A.
   i. Regulations on the discharge of industrial pollutants in water,threshold limits.
   ii. Types of waste water, sources of pollutants, classification ofpollutants.
   iii. Site selection, sampling, preservation, water qualityparameters and significance, monitoring, determination ofBOD and COD.
   iv. Dissolved Oxygen balance in water, self purification of a water system (Critical deficit of a runoff).

  B. **Some fundamental aspects of microbiology as applied to pollution control.**
  C. **Control of Water Pollution :**
   • Basic approach to solve the problem.
   • Primary, secondary and tertiary treatment of waste water, clariflocculation, sludge disposal.

- Treatment of phenolic waste water and also water containing N and P.
- Control of heavy metal ions, As, Hg, Cr.

> **SOLID WASTE MANAGEMENT**:

Types of solid wastes, sources and composition, methods of waste management-sanitary landfill, composting, incineration, pyrolysis, anaerobic digestion, concepts of recycling.

- Design of lagoons, oxidation pond, activated sludge process units, gravity settler, Rotating Biological Cyclone (RBC) separators, anaerobic digester, and stack for emission control.

DESIGN OF PIPE FITTINGS AND JOINTS: Design and schematic of simple boltsand screws. Riveted joints. Design & Draw of shafts and couplings.

DESIGN OF STORAGE TANK: Design and schematic of storage tank,(vertical and horizontal) supports.

HYDROELECTRICITY - its production and future prospects in India.

RESERVOIR CONSIDERATION: Hydrocarbon properties of oil &gas,Characteristics of reservoir rocks, porosity, permeability, resistivity etc, Fluid flow in the reservoir, Reservoir drive mechanism, reservoir homogeneity.

DRILLING TECHNOLOGY: Methods of Drilling, Rotary Drilling rig, Rotary rigcirculation system, Basic operation in drilling, the drill stem, Introduction tooffshore drilling, types ofoffshore rigs,

WELL COMPLETION: Casing and Cementation, Well Head, Production Techniques

PROBLEM WELL ANALYSIS: Low reservoir pressure, Low reservoir permeability,plugging, high viscosity oil, Removal of wax deposits etc.

04.11.23

Controller of Examinations
Assam Public Service Commission,
Jawaharnagar, Khanapara, Guwahati-22

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