Syllabus for the post of JUNIOR TECHNICAL SUPERINTENDENT (Chemical Engineering)
(WRITTEN TEST & SKILL TEST)

HEAT TRANSFER: Fundamentals of Heat Transfer, Equipment set-up and maintenance, Conduction, Convection, Radiation, Heat Exchangers, Evaporation.

FLUID FLOW OPERATION: Fundamentals of Fluid Mechanics, Equipment set-up and maintenance, Viscosity, Newtonian and non-Newtonian fluids, Surface-tension, Pressure and pressure measurement, Buoyancy, Conservation of mass, momentum and energy, Bernoulli equation and its applications, Laminar and turbulent flow, Friction factor, Flow through fluidised and packed bed, Pump, Cavitation.

MASS TRANSFER: Equipment set-up and maintenance, Molecular Diffusion in Fluids- Steady-state molecular diffusion in fluids at rest, Equipment for Gas-Liquid Operations- Tray towers, Packed towers, Humidification Operations, Gas Absorption- Equilibrium solubility of gases in liquids, Countercurrent multistage operation; one component transferred, Continuous contact equipment, Distillation- Vapor-liquid equilibria, Single-stage operation - flash vaporization, Differential, or simple, distillation, Continuous rectification - Binary systems, Liquid Extraction- Differential (continuous-contact) extractors, Adsorption and Ion Exchange- Liquids, Continuous contact, Drying- Batch drying, The mechanisms of batch drying, Leaching- Unsteady-state operation

INSTRUMENTATION AND CONTROL: Influence of external disturbances, Variables in a chemical processes, control aspect of chemical plant, Laplace transformation, First order system, dynamics of feedback controllers, Equipment set-up and maintenance, Introduction to Instrumentation, Temperature Measuring Devices, Measurement of Pressure & Vacuum, Measurement of Head and Level, Process Recording Instruments

REACTION ENGINEERING: Introduction to reaction engineering, Equipment set-up and maintenance, Introduction to reaction engineering, Kinetics of homogeneous reaction, Interpretation of ideal and non-ideal reactor data, Introduction to reactors in series, PBR and Semi-batch reactor, RTD

ENGINEERING MEASUREMENTS: Introduction to Physical Quantities and Units, Linear Measurements, Precision Measurements, Measurement of Area, Measurement of Electrical Energy, Measurement of frictional coefficient, Measurement of volumetric flow rate & Mass flow rate, Measurement of pH, Measurement of hardness of water, Measurement of Specific Gravity, Measurement of Viscosity.

PROCESS CALCULATIONS: Introduction, Basic Chemical Calculations, Material Balance with and without chemical reaction, Energy Balance, Combustion, ideal gas law.

MECHANICAL OPERATION: Introduction and concepts of Mechanical Operations, particulate solids, Screen Analysis, Size Reduction, Sedimentation, Filtration, Agitation and Mixing, Equipment set-up and maintenance.

INDUSTRIAL SAFTY AND ENVIRONMENTAL ENGINEERING: General Introduction & Concept of Safety, Chemical & Fire Hazards & their Control, Other hazards & occupational diseases, Personal Protective Devices, Introduction to pollution, Air Pollution, Water pollution, Solid waste of disposal.

PLANT UTILITIES AND ENERGY ENGINEERING: Introduction, Conventional fuels, Non-conventional sources of energy, Water & Steam, Air & Refrigeration, Equipment set-up and maintenance.

COMPUTER AWARENESS: Applications of computers in Chemical Instrumentation and Process Control, Basic knowledge of Computer Applications, viz. MS Word, MS Excel, Power Point etc. Internet, Windows.

COMMUNICATION SKILLS: English grammar, vocabulary, oral and written communication.

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