FTRA & FTPA RECRUITMENT 2024 – UPDATE ON COMPUTER BASED TEST & SYLLABUS

Computer Based Test (CBT) (written test) for candidates of FTPA & FTRA (M.Tech) will be held on **27.10.2024 (Sunday).** Hall Tickets will be despatched shortly.

1. Time duration of examination: **2 hours** (11.00 a.m to 01.00 p.m.)
2. Marks per question : **1 mark**
3. Type of question: **MCQs**
4. Negative marking : - **0.25 for each wrong answer**
5. Minimum qualifying marks in CBT:
    a. 50% marks in Domain for all Categories and 60% overall marks (Domain + General Aptitude) for **UR** candidates
    b. 50% marks in Domain for all Categories and 54% overall marks (Domain + General Aptitude) for **SC/ST/OBC-NC/PWD** candidates

Following is the brief Syllabus for the CBT.

NOTE: The syllabus/topics mentioned are indicative in nature. Candidates are expected to possess significant knowledge/proficiency pertaining to the relevant subjects.

General Aptitude 30 marks: English Verbal, Analytical Reasoning, Numerical Ability

Domain 70 marks for respective streams

| PA - Polymer / Plastic | Introduction to Polymers; Polymerization Techniques; Types of Polymers – structure property Relationship; Natural vs. Synthetic Polymers; Polymer Processing Techniques ; Properties of Polymers -Testing & Characterization method, Standards, SOP & instruments used ; Polymer Degradation and Environmental Impact | RA (M.Tech) - Polymer / Plastic | Introduction to Polymers - Definition and Classification of Polymers; Polymerization Processes ; Polymerization Techniques - Ziegler-Natta Catalysis ; Free Radical Polymerization ; Types of Polymers – structure property Relationship ; Natural vs. Synthetic Polymers; Polymer Processing Techniques ; Properties of Polymers - Testing & Characterization method, Standards, SOP & instruments used ; Polymer Degradation and Environmental Impact; Advanced Topics in Polymer Science - Nanocomposites in Polymers - Conductive Polymers ; Polymers in Biomedical Applications |

PA – Chemistry / Material Sciences	**Inorganic Chemistry**: Periodic trends, structure, and bonding in molecules (VSEPR, acids/bases), synthesis and properties of main group elements and transition metals, coordination compounds, organometallics (synthesis, bonding, catalysis), analytical techniques (IR, Raman, NMR, EPR, UV-vis, MS), nuclear chemistry, and radio-analytical techniques. **Physical Chemistry**: Quantum mechanics, atomic and molecular spectroscopy, group theory, thermodynamics, statistical mechanics, electrochemistry, kinetics, colloids and surfaces, solid-state chemistry, polymer chemistry, and data analysis. **Organic Chemistry**: IUPAC nomenclature, stereochemistry, reactive intermediates, reaction mechanisms (addition, elimination, substitution), named reactions, organic transformations, asymmetric synthesis, pericyclic and photochemical reactions, natural product chemistry, and structure determination techniques (IR, UV-Vis, NMR, MS).

PA – Automobile & Mechanical Engg	**Thermodynamics**: Introduction to systems, laws of thermodynamics, heat and work interactions, heat engines, heat pumps, refrigerators, Carnot cycle, and entropy; **Heat Transfer & Thermal Power Plants**: Modes of heat transfer, Rankine cycle, boilers (Babcock & Wilcox, Cochran), and thermal power plant layout ; **Internal Combustion Engines**: Carnot, Otto, Diesel cycles, engine components, working of four-stroke and two-stroke engines, valve timing, fuel systems, cooling, ignition, lubrication, and governing systems. Power, efficiency, performance testing, and simple numerical problems; **Basic Automobile Engineering**: Overview of engines, transmission, brakes, steering, fuel types, manual vs. automatic transmission, and safety features.	**RA (M.Tech) – Mechanical / Automobile / Combustion / Emission / Thermal Engg**	**Fluid Mechanics**: Properties of fluids, fluid statics, submerged bodies, Bernoulli's equation, control-volume analysis, viscous and turbulent flow, pipe flow, head losses, and basics of compressible flow; **Heat Transfer**: Conduction, convection, radiation; heat exchangers, fins, thermal boundary layers, convective heat transfer correlations, LMTD, NTU methods, and radiation laws; **Thermodynamics**: Laws of thermodynamics, work, heat, properties of gases, ideal and real behavior, availability, irreversibility, and thermodynamic relations; **Internal Combustion Engines**: IC engine cycles, components, fuel systems, emissions control, alternative fuels, performance testing, turbocharging, and future trends like hybrid vehicles and sustainable fuels, Emission standards, standard test methods.

RA – (M.Tech) Metallurgy (Corrosion studies)	Physical Metallurgy, Phase diagram, Iron and Steel making, Material Science and various materials, Mechanical Metallurgy, Corrosion Engineering, Materials Testing and standards, Materials Characterization, Surface finishing, Welding, Heat treatment of metals and alloys, Non-destructive testing.	

| PA – Chemical & Petroleum Refining | Alternative Energy: Solar, hydrogen. decarbonization, environment. ; Chemical Safety: Hazard Identification: risk assessment, hazard analysis techniques, Personal Protective Equipment, Process Safety ; Fluid Mechanics: Fluid properties, fluid statics, and fluid dynamics. Laminar and turbulent flow, flow in pipes and channels. Dimensional Analysis, Boundary Layer Theory; Heat Transfer: Conduction, convection, and radiation, Heat Exchangers ; Mass Transfer: Diffusion, mass transfer coefficients, Vapor-liquid equilibria, distillation columns, design and operation, Absorption ; Process Calculation: Material Balances, reactive and non-reactive systems, Energy Balances, enthalpy calculations. Stoichiometry, limiting reactants, yield. ; Process Engineering: Process Design: Flow sheet, Process Control; Reaction Engineering: Reaction Kinetics: Rate laws, reaction mechanisms, Batch, continuous stirred tank, and plug flow reactors, Catalysis ; Refining and Petrochemicals process & safety. Different unit of operation in refinery and petrochemicals | RA (M.Tech) –Chemical Engg |
Alternative Energy: Solar, hydrogen. decarbonization, environment. ; Chemical Safety: Hazard Identification: risk assessment, hazard analysis techniques, Personal Protective Equipment, Process Safety; Fluid Mechanics: Fluid properties, fluid statics, and fluid dynamics. Laminar and turbulent flow, flow in pipes and channels. Dimensional Analysis, Boundary Layer Theory ; Heat Transfer: Conduction, convection, and radiation, Heat Exchangers; Mass Transfer: Diffusion, mass transfer coefficients, Vapor-liquid equilibria, distillation columns, design and operation, Absorption ; Process Calculation: Material Balances, reactive and non-reactive systems, Energy Balances, enthalpy calculations. Stoichiometry, limiting reactants, yield. ; Process Engineering: Process Design: Flow sheet, Process Control ; Reaction Engineering: Reaction Kinetics: Rate laws, reaction mechanisms, Batch, continuous stirred tank, and plug flow reactors, Catalysis ; Refining and Petrochemicals process and safety. Different unit of operation in refinery and petrochemicals, Net zero |

PA – Bio Sciences, Bio Technology, Microbiology	Introduction to Biochemistry; Macromolecules and their qualitative and quantitative analysis; Biochemical Techniques; Bioanalytical Techniques; Microbiology; Molecular Biology; Basics of Cell Biology	RA (M.Tech) –Bio Technology	Biochemistry; Macromolecules and their qualitative and quantitative analysis; Biochemical Techniques; Bioanalytical Techniques; Microbiology; Molecular Biology; Cell Biology; Enzymes – mechanism of action and kinetics