

**SYLLABUS FOR THE POST OF PRINCIPAL ITI / ASSISTANT
DIRECTOR (TRAINING) IN TAMIL NADU EMPLOYMENT AND
TRAINING SERVICE (DEGREE STANDARD)**

SUBJECT CODE: 230

UNIT- I: MATHEMATICS

Matrices: Eigenvalues - Eigenvectors – Cayley – Hamilton theorem – Similar and Orthogonal transformations – Reduction of a quadratic form to canonical form by orthogonal transformation.

Ordinary Differential Equations: Order and degree – Types of Equations – Higher order linear ODE with constant coefficients - Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficient.

Functions of Several Variables: Partial derivatives – Total derivatives – Euler’s theorem – Implicit functions – Jacobians – Taylor’s theorem – Maxima and Minima.

Integration: Techniques of integration using integration by parts and Bernoulli’s formula – Line, Surface and Volume Integrals – Change of order of integration.

Vector Calculus: Vectors and scalars – Directional derivatives – Gradient, Divergence and Curl of vectors – Applications of Green’s theorem, Gauss divergence theorem and Stoke’s theorem.

Complex Variables: Verification of Analyticity – Construction of Analytic functions – Conformal Mappings – Bilinear transformations.

Complex Integration: Cauchy’s integral theorem – Cauchy’s fundamental theorem – Cauchy’s residue theorem – Taylor’s theorem – Laurent’s series – Contour integration (excluding poles on the real axis).

Laplace Transform: Existence of Laplace transform – Laplace transform of elementary functions – Properties – Laplace transform of Periodic functions – Inverse Laplace transform – Convolution theorem – Solution of linear second order ODE by Laplace transform technique.

UNIT – II: ENGINEERING PHYSICS

Newton’s laws of motion – Gravitation – Work, Energy and Power - Elasticity – Moduli of elasticity and their determination - Sound intensity level – Reverberation – Ultrasonics: production and detection - Thermal conductivity and expansion - Flow of heat - Thermodynamics - Heat engines – Optical interference, Anti-reflection coatings - Diffraction and polarization – Lasers and types - Optical fibres and applications -

Photoelectric effect - Atom models - Dual nature of matter and radiation - Nuclear models – Radioactivity - Nuclear fission and fusion - Crystal structures - Unit cells - Packing factor – Imperfections – Superconductivity - Magnetic and dielectric materials – Semiconducting materials - Nano materials.

UNIT- III: ENGINEERING CHEMISTRY

Fuel – Classification of fuels - Calorific value – Solid fuel – Liquid fuel – Gaseous fuel – Octane number – Cetane Number – Fuel Cells. Lubricants – Classification – Greases – Solid Lubricants. Water – Sources – Classifications – Softening process – Desalination – RO Method – Internal treatment – Treatment of Water for Municipal purposes. Plastics – High polymer – Classification – Polymerization techniques – Thermoplastics – Thermosetting resins – Examples. Rubber – Types of Rubber – Vulcanisation – Properties – Unvulcanised and Vulcanised. Natural Rubber – Synthetic Rubber – Examples. Refractories – Classification – Manufacture of Refractories – Magnesite – Silica – Zirconia – Chromite. Abrasives – Natural – Artificial – Abrasive paper & cloth. Corrosion: Dry and Wet corrosion – Factors affecting corrosion - Different types of corrosion. Productive coating – Hot dipping - Metal cladding, Electrodeposition – Organic Coatings – Paints – Varnishes. Cement and lime - Setting and hardening. Explosives – Classifications – Characteristics - Requirements for good explosives – nitrocellulose - TNT- TNB-DNB-PETN-RDX. Alloys - Purpose of making alloy - Types of alloys - Ferrous alloys. Electrochemistry – Conductors and non conductors – Kohlrausch law – Electrochemical cell - Reversible and irreversible cells – EMF - Concentration cell - Polarization – Over voltage, Decomposition potential.

UNIT- IV: ENGLISH

Grammar: Articles – Prepositions – Tenses (simple present, present continuous, simple past, past continuous, future, & perfect tenses) – Modal verbs – Clauses – Conditional clauses – Subject - Verb agreement – Conjunctions – Active & Passive voice – Reported speech (Direct to Indirect speech) – Error correction – Combining sentences using connectives – Cause & Effect expressions (because, so, due to, on account of, etc.) – Framing questions (converting statements into questions).

Vocabulary: Synonyms & Antonyms – Prefixes, Suffixes & Intensifying prefixes (e.g. Flammable – Inflammable) – Phrasal verbs – Idioms – Fixed expressions (e.g. adhere to, lodge a complaint to, etc.) – One word substitution – Collocation – Expansion of compound nouns (e.g. keyboard).

Reading: Reading comprehension passage – Data interpretation (e.g. comprehension questions based on table /chart) – Choosing appropriate title for a given short passage – Inferential questions based on a short reading passage – Reading comprehension questions making use of scanning & skimming strategies – Jumbled Sentences.

Writing: Definitions (instrument & technical terms) – Visual interpretation (picture/photo/chart etc.) – Process description – Letter writing (formal / official) – Email communication (email etiquette) – Essays.

UNIT- V: BASICS OF COMPUTER ENGINEERING

Computer Organization: CPU and Microprocessor [ALU, Control Unit and Bus Structure] – Data Storage [Primary, Secondary and Virtual] – Input and Output Devices.

Systems Software: Assembler – Compiler – Loader – Linker – Operating Systems.

Programming Languages: Classification of Programming Language, High-Level Languages.

Basic Computer Networking: Network Components [Routers, Bridges, Gateways] – ISO-OSI Reference Model – LAN – WAN – Client-Server Architecture – Internet.

Applications: Office Tools – Word-processor – Spreadsheet – Powerpoint – Database – E-mail – Browser.

IT Enabled Services: E-Government – E-Commerce – Multimedia.

UNIT- VI: BASICS OF CIVIL AND MECHANICAL ENGINEERING

Introduction to Engineering mechanics – Units and Dimensions – Laws of Mechanics – Coplanar Forces – Static Equilibrium of Rigid body – Moment of a force – Free body diagram – Friction – Laws of friction – Sliding friction – Wedge friction – Rolling resistance – Lader friction - Friction in screws – Screw jack – Belt friction – Properties of surfaces and solids – Centroids and centre of mass – Line and areas – Rectangular, Circular, Triangular areas by integration – T-section, I-section, Angle section, Hollow section – Area moment of inertia of plane areas – Parallel axis theorem – Centroid of the simple solids – Dynamics of particle – Displacement, velocity and acceleration – Different types of motion – Rectilinear, Curvilinear and Projectile motions – Newton's II-law of motion – Work Energy equation – Impulse and momentum principles.

UNIT- VII: BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Ohm's law - Kirchoff's laws - Introduction to DC and AC circuits – Power and powerfactor – Single phase and three phase circuits.

Operating principles of moving coil and moving iron instruments (Voltsmeters and Ammeters) - Wattmeters and Energy meters.

Construction and principle of operation: DC motors - DC generators – Transformers - Induction motors.

Characteristics of PN junction diode - Zener diode - Half wave and full wave rectifiers - Bipolar junction transistor (CC,CE,CB configurations) – Amplifiers - Operational amplifiers.

Binary number system - Logic gates - Boolean algebra – Half and full adders - Flip-flops – Registers and counters - A/D and D/A conversion.

Types of analog and digital signals - Modulation and Demodulation (Amplitude and frequency).

Communication systems: Radio - TV- Fax- Microwave - Satellite and optical fibre.

UNIT- VIII: PRINCIPLES OF MANAGEMENT

Management - Definition, Evolution - Taylor, Fayol, Elton Mayo, Peter Drucker.

Planning - Types, Steps, Forecasting, MBO, MBE.

Organising – Departmentation - Line and staff, Delegation and Decentralization.

Staffing - Manpower planning, Recruitment and selection, Training, Performance Appraisal.

Directing - Leadership styles, Discipline, Communication in business.

Controlling - Types, Control Techniques, Budgetary Control, Statistical Control.

UNIT- IX: TOTAL QUALITY MANAGEMENT

Quality - Vision, mission and policy statement, dimensions of product and service quality, contributions of quality gurus - Deming, Juran, Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Cost of Quality, continuous process improvement - PDCA, Quality Circle, 5S, Kaizen, Statistical Process Control (SPC), 7 QC Tools, new management tools, benchmarking, 6 sigma, Process Quality, Quality Function Deployment (QFD), POKA YOKE, Total Productive Maintenance (TPM), Business Process Reengineering (BPR), ISO 9004: 2000 - QMS, ISO-14000.

UNIT- X: ENVIRONMENTAL SCIENCE AND ENGINEERING

Environment – Global perspective - Awareness of environmental pollution - Classification of Pollutants - Air Pollution - Composition of Air – Major sources of air pollution. Gaseous Pollutants - Effect of air pollution on weather, climate, atmospheric process, NOX, SO₂, CO, CO₂, Fly ash, Vehicular pollution - Automobile emission – Prevention - Green house effect – Chlorofluoro carbon - Ozone layer - Ozone depletion – Smog - Photochemical smog, acid rain. Water pollution - Types of water pollution -

Factors affecting surface water – Sewage and domestic waste – BOD, COD. Industrial effluent - Harmful effects of industrial pollutants - Agricultural discharge – Detergent and toxic metal – Siltation. Thermal pollutants - Effect of thermal pollution - Radioactive pollutant – Inorganic pollutants and its detrimental effects. Soil Pollution - Sources of soil pollution - Effect of carbon waste - Noise pollution - Sources of noises of pollution - Types of noise pollution - Prevention and control.
