

TAMIL NADU PUBLIC SERVICE COMMISSION

SYLLABUS FOR THE POST OF PRINCIPAL / ASSISTANT DIRECTOR (TRAINING)

IN TAMIL NADU EMPLOYMENT AND TRAINING SERVICE (Degree Standard)

Code No.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 (voltmeters 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 houseeffect – 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.