SYLLABUS FOR DIRECT RECRUITMENT TO THE CADRE OF TTA THROUGH COMPETITIVE EXAMINATION

Standard and syllabi

The standard of paper in General ability test will be such as may be expected of an engineering diploma holder. The standard of papers in other subjects will approximately be that of Diploma level of an Indian polytechnic. There shall be three written (objective type) papers (Paper – I, Paper II, Paper III) as per details given below :

Paper		**Marks**	**Time allowed**
Paper I	General ability test	100	2 hours
Paper II	Basic Engineering	500	3 hours
Paper III	Specialization	500	3 hours

Detailed Syllabus

PAPER - I

General Ability Test : 100 Marks

The candidate's comprehension and understanding of General English shall be tested through simple exercises such as provision of antonyms and synonyms, fill in the blanks and multiple choice exercises etc. This shall also include questions on current events, general knowledge and such matters of everyday observation and experience as may be expected of an educated person.

PAPER - II

Basic Engineering : 500 Marks

Detailed Syllabus is as under :

1. Applied Mathematics : Co-ordinate Geometry; Vector Algebra; Matrix and Determinant: Differential Calculus and Integral Calculus: Differential equation of second order: Fourier Series; Laplace Transform; Complex Number; Partial Differentiation.

2. <u>Applied Physics</u>: Measurement – Units and Dimensions; Waves, Acoustics, Ultrasonics; Light; Laser and its applications; Atomic Structure and Energy Levels.

3. <u>Basic Electricity</u>: Electrostatics, Coulomb's Law, Electric field, Gauss's Theorem, concept of potential difference; concept of capacitance and capacitors; Ohm's law, power and energy, Kirchoff's voltage, current laws and their applications in simple DC circuits; Basic Magnetism; Electro Magnetism: Electromagnetic induction; concept of alternating voltage & current; Cells and Batteries; Voltage and Current Sources; Thevenin's theorem, Norton's theorem and their applications.

4. <u>Electronic Devices and Circuits</u>: Classification of materials into conductor, semi conductor, Insulator etc., electrical properties, magnetic materials, various types of relays, switches and connectors. Conventional representation of electric and electronic circuits elements. Active and passive components; semi conductor Physics; Semi conductor Diode; Bipolar Transistor & their circuits; Transistor Biasing & Stabilisation of operating point; Single stage transistor amplifier'; field effect transistor, Mosfet circuit applications.

   Multistage Transistor Amplifier; Transistor Audio Power Amplifiers; Feedback in amplifier; Sinusoidal Oscillators; Tuned Voltage amplifiers; Opto Electronics Devices and their applications; operational amplifier; Wave shaping and switching circuits.

   Block Diagram of I.C. timer (such as 555) and its working Multivibrator Circuits; time base circuits; thyristors and UJT regulated power supply.

5. <u>Digital Techniques</u>: Applications and advantages of digital systems; number system (binary and hexadecimal); Logic Gates; Logic Simplifications; Codes and Parity; Arithmetic Circuits; Decoders, Display Devices and Associated Circuits; Multiplexers and De-multiplexers; Latches and Flipflops, Counters, Shift Register, Memories; A/D and D/A converters.

PAPER - III

<u>Specialisation</u> - 500 marks

The candidate shall be allowed to choose any two out of the following sections. Each section shall consist of 250 marks. In the event of a candidate attempting more than 2 sections, the first two sections attempted in alphabetical order shall only count. Candidates are in their own interest advised not to attempt more than 2 sections.

Section A   :   Electrical

Section B   :   Communication

Section C   :   Networks, Filters and Transmission Lines

Section D   :   Instruments and Measurements

Section E   :   Control Systems

Section F   :   Microprocessors

Section G   :   Computers

Detailed syllabus for each section is as under:-

PAPER - III

Section A   :   Electrical

3 Phase vs single phase supply, Star Delta connections, relation between phase & line voltage, power factor and their measurements, constructions and principles of working of various types of electrical measuring instruments, all types of motor and generator – AC & DC, transformers, starters, rectifiers, inverters, battery charges, batteries, servo and stepper motors, contactor control circuits, switchgear, relays, protection devices & schemes, substation, protective relaying, circuit breaker, generator protection, transformer protection, feeder & lightening protection, feeder & busbar protection, lightening arrestor, earthing, voltage stabilizer & regulators, power control devices & circuits, phase controlled rectifiers, inverters, choppers, dual converters, cycloconverters; power electronics application in control of drivers, refrigeration & airconditioning.

Section B   :   Communication

Modulation and demodulation – principles and operation of various types of AM, FM and PM modulators/demodulators; pulse modulation – TDM, PAM, PPM, PWM; Multiplexing, Principles and applications of PCM.

Introduction of Basic block diagram of digital and data communication systems; Coding error detection and correction techniques; Digital Modulation Techniques – ASK, ICW, FSK, PSK; Characteristics/ working of data transmission circuits, UART, USART; Modems, Protocols and their functions, brief idea of ISDN interfaces, local area Network; Carrier Telephony -– Features of carrier telephone system.   ... 4 ...

Microwave Engineering: Microwave Devices; Waveguides; Microwave Components; Microwave antennas; Microwave Communication Systems – Block diagram & working principles of microwave communication link.

Section C : Network, Filters and Transmission Lines

Two port network; Attenuators , Filters; Transmission Lines and their applications; characteristic impedance of line; concept of reflection and standing waves on a transmission line; Transmission line equation; Principle of impedance matching; Bandwidth consideration of a transmission line.

Section D : Instruments and Measurements

Specifications of instruments accuracy, precision, sensitivity, resolution range, Errors in measurement and loading effect; Principles of voltage, current and resistance measurements Transducers, measurement of displacement & strain, force & torque measuring devices, pressure measuring devices, flow measuring devices, power control devices & circuits. Types of AC millivoltmeters – Amplifier rectifier and rectifier amplifier; Block diagram explanation of a basic CRO and a triggered sweep, oscilloscope, front panel controls; Impedance Bridges and Q Meters; Principles of working and specifications of logic probes, signature analyser and logic analyser, signal generator, distortion factor meter, spectrum analyser.

Section E : Control systems

Basic elements of control system, open and closed loop system, concepts of feedback. Block diagram of control system. Time lag, hysterisis, linearity concepts. Self regulating and non self regulating control systems. Transfer function of simple control components, single feedback configuration.

Time response of systems.

Stability Analysis – characteristic equation, Routh's table Nyquist critereon, Relative stability, phase margin and gain margin.

Routh Hurwitz critereon, root locus technique, Bode plot, Polar plot, Gain margin and phase margin.

Section F   :   Microprocessors

Typical organisation of a microcomputer system & functions of its various blocks; Architecture of a Microprocessor; Memories and I/O Interfacing ; Brief idea of M/C & assembly languages, Machines & Mnemonics codes; instruction format and Addressing mode; concept of Instructionset ; programming exercises in assembly language; concept of interrupt; Data transfer techniques – Sync data transfer, async data transfer, interrupt driven data transfer, DMA , serial output data, serial input data.

Section G   :   Computers

Computer and its working, types of computers, familiarisation with DOS and Windows – concept of file, directory, folder, Number systems, Data representation; Programming _ Elements of high level programming language, PASCAL, C; use of basic data structures; Fundamentals of computer architecture, Processor design, Control unit design, Memory organisation. I/O system organisation. Microprocessors – micro processor architecture.   Instruction set and simple assembly level programming. Microprocessor based system design ; typical examples. Personal computes and their typical uses, data communication principles, types and working principles of modems, Network principles, OSI model, functions of data link layer and network layer, networking components, communication protocols- X –25, TCP/IP.

Database Management System – basic concepts, entity relationship model, relational model, DBMS based on relational model.

✳ ✳ ✳ ✳ ✳