SYLLABUS FOR TECHNICAL OFFICER - SCERT UNDER SCHOOL EDUCATION DEPARTMENT-2025

PLAN OF EXAMINATION

(i)   The Examination shall be conducted according to the following plan:

    (a)   The examination shall comprise of written examination and personal interview.

    (b)   The written examination will consist of three papers of Engineering/Architecture, General English and General Studies.

    (c)   Engineering / Architecture papers will carry 200 marks each. (Objective type – 100 marks and short answer questions carrying not more than 5 marks – 100 marks.)

    (d)   General English will carry 100 marks and the question will be conventional type.

    (e)   General Studies shall carry 100 marks and the question shall be objective type.

    (f)   Personal Interview will carry 100 marks.

    (g)   The duration of examination for each papers shall be 3 hrs.

    (h)   The standard and syllabi prescribed for these papers are given in Schedule-I.

    (i)   The standard of papers shall be a degree level of Indian University.

(ii)   All questions will be set and answered in English only.

(iii)   Candidates, other than those with locomotor disability, must write in their own hand. In no circumstances will they be allowed to avail the help of a scribe. In case of those candidates who are allowed the use of a scribe, an extra 20 minutes per hour on pro-rata basis for a written test of 1(one)hour or less than one hour or more than one hour duration shall be granted. Further, the expenses for engagement of the scribes are to be borne by the candidate himself/herself. Such candidates should report themselves to the Controller of Examinations two weeks prior to the commencement of the examination.

SYLLABUS

GENERAL ENGLISH - 100 Marks

The question paper in General English will be designed to test the candidate's ability of understanding English. The pattern of question will be as follows :

    (i)   Comprehension of given passage   -   20 marks

    (ii)   Precis writing   -   20 marks

    (iii)   Usage and vocabulary   -   40 marks

    (iv)   Short Essay.   -   20 marks

GENERAL STUDIES - 100 Marks

The nature and standard of questions in the General Studies will be such that a well-educated person will be able to answer them without any specialized study. The questions will be such as to test a candidate's general awareness of a variety of subjects, which will have relevance for a career in Engineering Services. The questions are likely to test the candidate's basic understanding of all relevant issues, and ability to analyze, and take a view on conflicting socio-economic goals, objectives and demands.

ELECTRONICS & COMMUNICATION ENGINEERING

PAPER - 1 – 200 Marks

1.   **Materials and Components:**

    Structure and properties of Electrical Engineering materials; Conductors, Semiconductors and Insulators, magnetic, Ferroelectric, Piezoelectric, Ceramic, Optical and Super-conducting materials. Passive components and characteristics Resistors, Capacitors and Inductors; Ferrities, Quartz crystal Ceramic resonators, Electromagnetic an Electromechanical components.

2   Physical Electronics, Electron Devices and ICs:

Electrons and holes in semiconductors, Carrier Statistics, Mechanism of current flow in a semiconductor, Hall effect; Junction theory; Different types of diodes and their characteristics; Bipolar Junction transistor; Field effect transistors; Power switching devices like SCRs, CTOs, power MOSFETs; Basics of ICs – bipolar, MOS and CMOS types; basic to Opto Electronics.

3   Signals and Systems

Classification of signals and systems: System modeling in terms of differential and difference equations; State variable representation; Fourier series; Fourier representation; Fourier series; Fourier transforms and their application to system analysis; Laplace transforms and their application to system analysis; Convolution and superposition integrals and their applications; Z-transforms and their

Applications to the analysis and characterization of discrete time systems; Random signals and probability, Correlation functions; Spectral density; Response of linear system to random inputs.

4   Network theory

Network analysis techniques; Network theorems, transient response, steady state sinusoidal response; Network graphs and their applications in network analysis; Tellegen's theorem. Two port networks; Z, Y h and transmission parameters. Combination of two ports, analysis of common two ports. Network functions: parts of network functions, obtaining a network function from a given part. Transmission criteria: delay and rise time, Elmore's and other definitions effect of cascading. Elements of network synthesis.

PAPER – II - 200 Marks

1.   Electromagnetic Theory

Analysis of electrostatic and magnetostatic fields: Laplace's and Piossons's equations; Boundary value problems and their solutions; Maxwell's equations; application to wave propagation in bounded and unbounded media; Transmission lines: basic theory, standing waves, matching applications, misconstrue lines.Basics of wave guides and resonators; Elements of antenna theory.

2   Analog Electronic Circuits:

Transistor biasing and stabilization. Small signal analysis. Power amplifiers. Frequency response. Wide banding techniques. Feedback amplifiers. Tuned amplifiers. Oscillators. Rectifiers and power supplies. Op Amp PLL, other linear integrated circuits and applications. Pulse shaping circuits and waveform generators.

3   Digital Electronic Circuits:

Transistor as a switching element; Boolean algebra, simplification of Boolean functions, Karnaguh map and applications; IC Logic gates and their characteristics; IC logic families: DTL, TTL, ECL, NMOS, PMOS and CMOS gates and their comparison; Combinational logic Circuits; Half adder, Full adder; Digital comparator; Multiplexer Demultiplexer; ROM and their applications. Flip flops. R-S, J.K, D and T flip-flops; Different types of counters and registers Waveform generators. A/D and D/A converters. Semiconductor memories.

4   Control Systems:

Transient and steady state response of control systems; Effect of feedback on stability and sensitivity; Root locus techniques; Frequency response analysis. Concepts of gain and phase margins: Constant-M and Constant-N Nichol's Chart; Approximation of transient response from closed loop frequency response; Design of Control Systems, Compensators; Industrial controllers.

PAPER-III - 200 Marks

1. Communication Systems:

Basic information theory; Modulation and detection in analogue and digital systems; Sampling and data reconstructions; Quantization & coding; Time division and frequency division multiplexing; Equalization; Optical Communication: in free space & fiber optic; Propagation of signals oat HF, VHF, UHF and microwave frequency; Satellite Communication.

2 Microwave Engineering:

Microwave Tubes and solid state devices, Microwave generation and amplifiers, Waveguides and other Microwave Components and Circuits, Misconstrue circuits, Microwave Antennas, Microwave Measurements, Masers, lasers; Microwave propagation. Microwave Communication Systems terrestrial and Satellite based.

3. Computer Engineering:

Number Systems. Data representation; Programming; Elements of a high level programming language PASCAL/C; Use of basic data structures; Fundamentals of computer architecture; Processor design; Control unit design; Memory organization, I/O System Organisation. Microprocessors: Architecture and instruction set of Microprocessors 8085 and 8086, Assembly language Programming. Microprocessor Based system design: typical examples. Personal computers and their typical uses.