



TEERTHANKER MAHAVEER UNIVERSITY

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Delhi Road, Moradabad (U.P.)

SYLLABUS FOR RESEARCH APTITUDE TEST IN ELECTRONICS & COMMUNICATION ENGINEERING

The syllabus for Research Aptitude Test (RAT) in Electronic & Communication is divided in two parts viz. Part A & Part B described below:

PART – A

Part A of the RAT shall be designed to assess the research skills/aptitude of the candidate consisting of questions from the following areas:

- 1. Research Methodology:** meaning, characteristics, and ethical issues in research; types of research; research methods
- 2. Logical Reasoning:** arguments, deductive and inductive research; logical and Venn diagram; inferences; analogies.
- 3. Data Interpretation:** interpretation of data; mapping and analysis of data, tools for data analysis; quantitative and qualitative research.
- 4. General Awareness about Basic Science:** basic science up to the level of SSC.
- 5. Mathematical Reasoning:** number series, letter series, codes; relationships, classification.

PART – B

Part-B of RAT is designed to assess subject specific knowledge of the candidate covering the syllabus given as below:

- 1. Basic circuit theory:** Network graphs, nodal and mesh analysis, Network theorems, Linear constant coefficient differential equations, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits, 2port network Parameters, State equations for networks.
- 2. Analog Circuits:** Simple diode circuits, clipping, clamping, rectifier, Amplifiers, Frequency response of amplifiers, Filters, oscillators, Function generators and wave Shaping circuits, 555 Timers.
- 3. Digital circuits:** Boolean algebra, logic gates, digital IC families, Combinational Circuits, Sequential circuits, Sample and hold circuits, ADCs, DACs, Semiconductor Memories.
- 4. Communications:** Probability theory & Statistics Random signals and noise, Analog Communication systems: amplitude and angle modulation and demodulation systems, Super heterodyne receivers; SNR calculations for amplitude modulation (AM) and

Frequency modulation (FM), Sampling theorem, Digital communication systems: PCM, DPCM, digital modulation schemes, TDMA, FDMA and CDMA and GSM, Optical fibre Communication.

5. **Signals and Systems:** Laplace transform, continuous time and discrete time Fourier series, continuous time and discrete time Fourier Transform, DFT and FFT, Z-transform, LTI Systems, Signal transmission through LTI systems, Convolution, FIR and IIR Filters, Open loop and closed loop systems, first order, second order, higher order Systems.
6. **Computer Networks:** ISO/OSI stack, LAN technologies (Ethernet, Token ring, etc), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP And sockets, IP (v4), Application layer protocols (dns, SMTP, pop, ftp, http); Basic Concepts of hubs, switches, gateways, and routers. Network security, basic concepts of Public key and private key cryptography, digital signature.
7. **Microprocessor and Computer Organization:** Microprocessor (8085): architecture, Programming, memory and I/O interfacing, Machine instructions and addressing modes, ALU and data path, CPU control design, Memory interface, I/O interface, Instruction Pipelining, Cache and main memory, Secondary storage, Microcontrollers.
8. **Digital Signal Processing:** Multirate filters, Trans-multiplexers, Wavelets, DSP applications – equalization, beam forming, echo cancellation, filter banks.