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*We Deliver Results,
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MEER SIR ACADEMY

M Sc Electronics

Entrance Test Syllabus 2027–2028

Course Code M 32

Department of Applied Sciences and Humanities

Faculty of Engineering and Technology

Jamia Millia Islamia New Delhi

2 Hours

Duration

100

Maximum Marks

25 percent

Negative Marking

Entrance Test Overview

The entrance examination assesses undergraduate-level knowledge across physics, quantum mechanics, mathematics, semiconductor devices, analog and digital electronics, microprocessors, and communication electronics. Candidates should prepare concepts, standard derivations, numerical applications, circuit behaviour, and device characteristics.

Test Component	Duration	Maximum Marks	Passing Standard	Negative Marking
Multiple Choice Questions	2 hours	100	Merit based	25% of the question mark

Subject Coverage at a Glance

Area	Major Focus
Physics	Atomic and nuclear physics, thermal physics, optics, lasers, fibre optics, dielectrics and electromagnetism
Quantum Mechanics	Wave functions, Schrödinger equation, operators, eigenstates and foundational principles
Mathematics	Vector calculus, matrices, differential equations, Fourier analysis
Semiconductor Devices	Carrier transport, junctions, diodes, BJTs, FETs and optoelectronic devices



Analog and Digital Electronics	Operational amplifiers, filters, logic gates, flip flops, registers and counters
Microprocessors	8085 and 8086 basics, instructions, interrupts, peripherals, DMA and later processors
Communication Electronics	Analog, angle, pulse and digital modulation and transmission

1. Physics

Prepare the following topics with emphasis on core principles, standard formulae, qualitative interpretation, and numerical problem solving.

- **Atomic physics:** Bohr model of the hydrogen atom; energy levels and spectra; correspondence principle; Stark effect; Zeeman effect.
- **Nuclear physics:** Nuclear mass and size; binding energy; stable nuclei; alpha, beta, and gamma decay.
- **Heat and thermodynamics:** Kinetic theory of gases; specific heat of solids; conduction, transmission, and radiation of heat; basic laws of thermodynamics; efficiency of engines; entropy and enthalpy; Maxwell relations.
- **Optics:** Basic concepts of geometrical and physical optics; interference, diffraction, and polarization of light and their applications.
- **Particle nature of radiation:** Photoelectric effect and Compton effect.
- **Lasers:** Coherence of light; principle of laser action; ruby laser; helium neon laser; optical resonators.
- **Fibre optics:** Types of optical fibres; numerical aperture; step index and graded index fibres; modal dispersion.
- **Dielectrics and electrostatics:** Polar and non-polar dielectrics; polarization; potential due to a dipole; susceptibility; Gauss law for dielectrics; dielectric boundary conditions; capacitance; current density; continuity equation.
- **Magnetostatics and electromagnetic induction:** Biot–Savart law; Ampere law; force between current loops; Faraday law; Lenz law; Maxwell equations; electromagnetic wave propagation.

2. Quantum Mechanics

This unit examines the transition from classical to quantum descriptions of microscopic systems.

- Failure of classical physics and the need for quantum mechanics.
- Probabilistic interpretation of waves and conditions for the physical acceptability of wave functions.
- Schrödinger wave equation for a free particle and for a particle in a one-dimensional force field.
- Boundary conditions and continuity conditions for wave functions.
- Operators in quantum mechanics.
- Time-independent one-dimensional Schrödinger equation; stationary states; eigenvalues and eigenfunctions.
- Hydrogen atom; de Broglie waves; Heisenberg uncertainty principle.

3. Mathematics

The mathematics section supports the analytical treatment of electronics, signals, fields, and physical systems.



- **Vector differential calculus:** Differentiation of scalar and vector fields and related applications.
- **Vector integral calculus:** Line, surface, and volume integrals; transformation between line integrals and double integrals; area in Cartesian and polar coordinates; Stokes theorem; Gauss divergence theorem.
- **Matrices:** Introduction to matrices; systems of linear algebraic equations; eigenvalues and eigenvectors; diagonalization; powers of a matrix.
- **Real and complex matrices:** Symmetric, skew-symmetric, and orthogonal matrices; quadratic forms; Hermitian, skew-Hermitian, and unitary matrices.
- **Ordinary differential equations:** Linear differential equations of second order and higher-order homogeneous differential equations.
- **Fourier analysis:** Fourier series, Fourier transforms, discrete Fourier transform, and fast Fourier transform.

4. Semiconductor Devices

Study semiconductor physics together with device construction, operating modes, characteristic curves, and applications.

- **Semiconductor fundamentals:** Intrinsic and extrinsic semiconductors; carrier concentration at thermal equilibrium; drift and diffusion of carriers; donors and acceptors; minority carriers; dependence of Fermi level on temperature and doping concentration; relationship among mobility, carrier concentration, and conductivity.
- **Semiconductor diodes:** p-n junction fundamentals; Zener and varactor diodes; diode breakdown; metal-semiconductor junctions; ohmic and rectifying contacts.
- **Bipolar junction transistors:** BJT fundamentals; transistor characteristics; transistor configurations and operating modes.
- **Field-effect transistors:** Fundamentals of JFETs, MESFETs, and MOSFETs.
- **Optoelectronic devices:** Phototransistors and solar cells.

5. Analog and Digital Electronics

Candidates should understand circuit operation, performance parameters, waveforms, truth tables, and common applications.

- **Operational amplifiers:** Differential amplifier; common-mode gain; differential gain; common-mode rejection ratio; offset voltage; offset null; slew rate; input offset current; input bias current; frequency response.
- **Operational amplifier applications:** Inverting and non-inverting amplifiers; voltage followers; addition, subtraction, differentiation, and integration; comparator; Schmitt trigger.
- **Active filters and signal conditioning:** First- and second-order low-pass and high-pass Butterworth filters; comparators; multivibrators; signal-conditioning circuits.
- **Digital fundamentals:** Number systems and logic gates.
- **Sequential logic:** RS, D, JK, T, master-slave, positive-edge, and negative-edge flip-flops; registers and counters.

6. Microprocessors

This unit covers architecture, memory addressing, programming fundamentals, interrupts, and programmable peripheral devices.

- **8085:** Introduction, fundamentals, and applications.
- **8086 architecture:** Internal architecture; real-mode memory addressing; instruction format.



- **Addressing modes:** Data-addressing modes, program-memory addressing modes, and stack-memory addressing modes.
- **Instruction set and programming:** Programming the 8086 using data-movement instructions; data transfers; miscellaneous transfer instructions; arithmetic and logic instructions; program-control instructions; introduction to interrupts.
- **Peripheral devices:** 8255 programmable peripheral interface; 8254 programmable interval timer; 8259 priority interrupt controller; 8251 USART.
- **Interrupts:** Basic interrupt processing; interrupt instructions; operation of real-mode interrupts; interrupt flag bits; hardware interrupts.
- **Direct memory access:** Introduction to DMA.
- **Other microprocessors:** Introduction to 80486, Pentium, and Pentium Pro processors; introduction to protected-mode memory addressing.

7. Communication Electronics

Prepare the principles, waveforms, spectra, bandwidth requirements, and basic transmitter and receiver concepts associated with communication systems.

- **Modulation and demodulation:** Fundamental concepts and basic amplitude modulation.
- **Angle modulation:** Elements of frequency modulation and phase modulation; frequency spectrum of FM waves.
- **Pulse modulation:** Pulse transmission; pulse-amplitude modulation; time-division multiplexing; pulse-time modulation; pulse-width modulation; pulse-position modulation.
- **Digital communication:** Bit transmission; signalling rate; digital filtering; pulse-code modulation.

Preparation Checklist

- Revise standard undergraduate definitions, laws, derivations, graphs, and device characteristics.
- Prepare formula sheets for mechanics of waves, thermodynamics, optics, electromagnetism, semiconductor transport, and communication systems.
- Practise numerical questions on matrices, differential equations, Fourier analysis, carrier concentration, operational amplifiers, filters, and modulation.
- Memorise pin functions and operating roles of the 8255, 8254, 8259, and 8251 peripherals.
- Solve timed objective tests and account for the 25% negative marking while deciding whether to attempt uncertain questions.

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