

## Topicwise Tests

Test No.	Test Syllabus	No. of Ques.	Marks	Time	Activation Date
1	<b>Electrical Circuits-1:</b> Voltage and current sources: independent, dependent, ideal and practical; v-i relationships of resistor, inductor, mutual inductor and capacitor; Kirchhoff's Law, mesh nodal analysis, superposition, Thevenin, Norton, maximum power transfer and reciprocity theorems; Peak-, average - and rms value of ac quantities; apparent active-and reactive powers; phasor analysis, impedance and admittance.	17	25	45 min	Active
2	<b>Electrical Circuits-2:</b> Electrical Circuits-2: Transient analysis of RLC circuits with dc excitation; series and parallel resonance, locus diagram, realization of basic filters with R, L and C elements. One-port and two-port networks, driving point impedance and admittance, open-and short circuit parameters, Transient analysis of RLC circuits with ac excitation.	17	25	45 min	
3	<b>Electric Machines</b> -Single Phase Transformer: equivalent circuit, phasor diagram, open circuit and short circuit test, regulation and efficiency; Three Phase Induction Motor: principle of operation, types, performance, torque-speed characteristics, no-load and blocked rotor test, equivalent circuit, starting and speed control; Types of losses and efficiency calculations of electric machines.	17	25	45 min	
4	<b>Electricity and Magnetism-1:</b> Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric Field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations	17	25	45 min	
5	<b>Electricity and Magnetism-2 :</b> Biot-Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive Force, Reluctance, Magnetic Circuits, Self and Mutual inductance of simple configurations.	17	25	45 min	
6	<b>Control Systems-1:</b> Feedback principles, signal flow graph, transient response, steady-state-errors, Routh Criteria, root loci, Bode Plot, phase and gain margin, Nyquist criteria.	17	25	45 min	Active
7	<b>Control Systems-2:</b> Design of lead, Lag and Lead-lag compensators, state space representation of systems; time delay systems, Mechanical, hydraulic and pneumatic system components, synchro pair, servo and stepper motors, servo valve; on-off, P, P-I, P-I-D, cascade, feedforward, and ratio controllers, Tuning of PID controllers and sizing of control valve	17	25	45 min	
8	<b>Sensors and Industrial Instrumentation-1:</b> Resistive, capacitive, inductive, piezoelectric, Hall effect sensor and associated signal conditioning circuits; transducers for industrial instrumentation: displacement (linear and angular), velocity, acceleration, force, torque, vibration, shock.	17	25	45 min	
9	<b>Sensors and Industrial Instrumentation-2:</b> Pressure (including low pressure), flow (differential pressure, variable area, electromagnetic, ultrasonic, turbine and open channel flow meter) temperature (thermocouple, bolometer, RTD (3/4 wire), thermistor, pyrometer and semiconductor); liquid level, pH, conductivity and viscosity measurement, 4-20mA two wire transmitter	17	25	45 min	
10	<b>Engineering Mathematics-1:</b> Linear Algebra, calculus, Vector Analysis, Numerical Methods.	17	25	45 min	
11	<b>Engineering Mathematics-2:</b> Differential Equations, Analysis of complex variables, Probability statistics, Fourier Series.	17	25	45 min	
12	<b>General Aptitude (Part-1):</b> Numerical Ability, Numerical computation, numerical estimation, and data interpretation.	17	25	45 min	

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13	<b>General Aptitude (Part-2)</b> : Verbal Ability: English grammar, sentence completion, verbal analogies, word groups, instructions, critical reasoning, numerical reasoning, verbal deduction and spatial aptitude.	17	25	45 min	Active
14	<b>Signals and Systems-1</b> : Periodic, aperiodic and impulse signals; Laplace, Fourier transform, transfer function, frequency response of first and second order linear time invariant systems, impulse response, convolution, correlation.	17	25	45 min	
15	<b>Signals and Systems-2</b> : z-transforms; Discrete time system: impulse response, frequency response, pulse transfer function; DFT and FFT; basics of IIR and FIR filters.	17	25	45 min	
16	<b>Measurement-1</b> : SI units, systematic and random errors in measurement, expression of uncertainty - accuracy and precision index, propagation of errors. PMMC, MI and dynamometer type instruments; dc potentiometer, Measurement of voltage and current., voltage and current scaling.	17	25	45 min	
17	<b>Measurement-2</b> : Bridges for measurement of R, Land C, Q-meter. Measurement of Power in single and three phase circuits; ac and dc current probes; true rms meters Instrument transformers, timer/counter, time, phase and frequency measurements, digital voltmeter, digital multimeter, oscilloscope, shielding and grounding.	17	25	45 min	
18	<b>Communication</b> : Amplitude and frequency modulation and demodulation; Shannon's sampling theorem. Pulse code modulation; frequency and time division multiplexing, amplitude-, phase, frequency, pulse shift keying for digital modulation, Quadrature amplitude modulation.	17	25	45 min	Active
19	<b>Analog Electronics-1</b> : Characteristics and applications of diode, Zener diode, BJT and MOSFET; small signal analysis of transistor circuits, feedback amplifiers.	17	25	45 min	
20	<b>Analog Electronics-2</b> : Characteristics of operational amplifiers; applications of op-amps: difference amplifier, adder, subtractor, integrator, differentiator, instrumentation amplifier, precision rectifier, active filters and other circuits. Oscillators, signal generators, voltage-controlled oscillators and phase locked loop, Sources and effects of noise and interference in electronic circuits.	17	25	45 min	
21	<b>Digital Electronics-1</b> : Basics of number systems, Combinational logic circuits, minimization of Boolean functions. IC families: TTL and CMOS. Arithmetic circuits, comparators, Schmitt trigger, multi-vibrators, Sequential circuits, flip flops, shift registers, timers and counters; sample-and-hold circuit, multiplexer.	17	25	45 min	
22	<b>Digital Electronics-2</b> : Analog-to digital (successive approximation, integrating, flash and sigma-delta) and digital-to analog converters (weighted R, R-2R ladder and current steering logic). Characteristics of ADC and DAC (resolution, quantization, significant bits, conversion/settling time), Embedded Systems: Microprocessor and microcontroller applications, memory and input output interfacing; basics of data acquisition systems, basics of distributed control systems (DCS) and programmable logic controllers (PLC).	17	25	45 min	
23	<b>Optical instrumentation-1</b> : Basics of fiber optic sensing, interferometer: applications in metrology.	17	25	45 min	
24	<b>Optical Instrumentation-2</b> : Optical sources and detectors: LED, laser, photo-diode, light dependent resistor and their characteristics. UV-VIS Spectro photometers, Mass spectrometer.	17	25	45 min	

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Detailed Schedule

# GATE 2024: Online Test Series

## INSTRUMENTATION ENGINEERING



### Single Subject Tests

Test No.	Test Syllabus	No. of Ques.	Marks	Duration	Activation Date
25	Electrical Circuits + Electrical Machines	33	50	90 min	Active
26	Control Systems + Process Control	33	50	90 min	
27	Sensors & Industrial Instrumentation	33	50	90 min	
28	Optical Instrumentation	33	50	90 min	
29	Engineering Mathematics	33	50	90 min	
30	General Aptitude	33	50	90 min	
31	Signals & Systems	33	50	90 min	Active
32	Measurements	33	50	90 min	
33	Communications	33	50	90 min	
34	Digital Electronics & Microprocessors	33	50	90 min	
35	Analog Electronics	33	50	90 min	
36	Electricity and Magnetism	33	50	90 min	

### Multiple Subject Tests

37	Electrical Circuits + Electricity and Magnetism + Electrical Machines	33	50	90 min	Active
38	Analog Electronics + Digital Electronics & Microprocessors	33	50	90 min	
39	Sensors & Industrial Instrumentation + Control Systems + Process Control	33	50	90 min	
40	Signals & Systems + Communications	33	50	90 min	
41	Measurements + Optical Instrumentation	33	50	90 min	
42	Engineering Mathematics + General Aptitude	33	50	90 min	

### Full Syllabus Tests

43	Full Syllabus Test-1 (Basic Level)	65	100	180 min	Active
44	Full Syllabus Test-2 (Basic Level)	65	100	180 min	
45	Full Syllabus Test-3 (Basic Level)	65	100	180 min	
46	Full Syllabus Test-4 (Basic Level)	65	100	180 min	
47	Full Syllabus Test-5 (Advance Level)	65	100	180 min	Active
48	Full Syllabus Test-6 (Advance Level)	65	100	180 min	
49	Full Syllabus Test-7 (Advance Level)	65	100	180 min	
50	Full Syllabus Test-8 (Advance Level)	65	100	180 min	

### Mock Tests

51	GATE Mock Test 1	65	100	180 min	Active
52	GATE Mock Test 2	65	100	180 min	
53	GATE Mock Test 3	65	100	180 min	
54	GATE Mock Test 4	65	100	180 min	