

IAS EXAM 2018 NEWS

NATIONAL LEVEL OFFLINE TEST

Table of Content

IAS Mains Electrical Engineering Syllabus

Last Updated - January 02, 2017

IAS Exam is held on multiple dates starting from December 03 to December 09, 2016. In **IAS Mains 2017** exam, there are 2 optional papers in UPSC civil services mains exam. In IAS Mains examination paper 6&7 are optional subject papers. You can choose Electrical Engineering as an optional subject, if you have graduated in Electrical Engineering as the main subject. With well-planned strategies, you can easily score well in Electrical Engineering. Interest should be the prime criteria for choosing any optional. Electrical Engineering paper consists of 250 marks. Duration for each Electrical Engineering mains paper is 3 hours. This article is providing the detailed syllabus of Electrical Engineering for **IAS Exam** (<https://collegedunia.com/exams/ias-exam>).

IAS Mains Electrical Engineering Paper 1 Syllabus

- 1. Circuit Theory:** Circuit components; network graphs; KCL, KVL; circuit analysis methods: nodal analysis, mesh analysis; basic network theorems and applications; transient analysis: RL, RC and RLC circuits; sinusoidal steady state analysis; resonant circuits; coupled circuits; balanced 3-phase circuits; Two-port networks.
- 2. Signals & Systems:** Representation of continuous-time and discrete-time signals & systems; LTI systems; convolution; impulse response; time-domain analysis of LTI systems based on convolution and differential/difference equations. Fourier transform, Laplace transform, Z-transform, Transfer function. Sampling and recovery of signals DFT, FFT Processing of analog signals through discrete-time systems.

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3. **E.M. Theory:** Maxwell's equations, wave propagation in bounded media. Boundary conditions, reflection and refraction of plane waves. Transmission line: travelling and standing waves, impedance matching, Smith chart.
4. **Analog Electronics:** Characteristics and equivalent circuits (large and small-signal) of Diode, BJT, JFET and MOSFET. Diode circuits: clipping, clamping, rectifier. Biasing and bias stability. FET amplifiers. Current mirror; Amplifiers: single and multi-stage, differential, operational, feedback and power. Analysis of amplifiers; frequency response of amplifiers. OPAMP circuits. Filters; sinusoidal oscillators: criterion for oscillation; single-transistor and OPAMP configurations. Function generators and wave-shaping circuits. Linear and switching power supplies.
5. **Digital Electronics:** Boolean algebra; minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinational circuits: arithmetic circuits, code converters, multiplexers and decoders. Sequential circuits: latches and flip-flops, counters and shift-registers. Comparators, timers, multivibrators. Sample and hold circuits, ADCs and DACs. Semiconductor memories. Logic implementation using programmable devices (ROM, PLA, FPGA).
6. **Energy Conversion:** Principles of electromechanical energy conversion: Torque and emf in rotating machines. DC machines: characteristics and performance analysis; starting and speed control of motors; Transformers: principles of operation and analysis; regulation, efficiency; 3-phase transformers. 3-phase induction machines and synchronous machines: characteristics and performance analysis; speed control.
7. **Power Electronics and Electric Drives:** Semiconductor power devices: diode, transistor, thyristor, triac, GTO and MOSFET-static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters: fully controlled and half-controlled; principles of thyristor choppers and inverters; DCDC converters; Switch mode inverter; basic concepts of speed control of dc and ac Motor drives applications of variable speed drives.
8. **Analog Communication:** Random variables: continuous, discrete; probability, probability functions. Statistical averages; probability models; Random signals and noise: white noise, noise equivalent bandwidth; signal transmission with noise; signal to noise ratio. Linear CW modulation: Amplitude modulation: DSB, DSB-SC and SSB. Modulators and Demodulators; Phase and Frequency modulation: PM & FM signals;

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narrowband FM; generation & detection of FM and PM, Deemphasis, Preemphasis. CW modulation system: Superhetrodyne receivers, AM receivers, communication receivers, FM receivers, phase locked loop, SSB receiver Signal to noise ratio calculation for AM and FM receivers.

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IAS Mains Electrical Engineering Paper 2 Syllabus

- 1. Control Systems:** Elements of control systems; block-diagram representation; open-loop & closedloop systems; principles and applications of feed-back. Control system components. LTI systems: time-domain and transform-domain analysis. Stability: Routh Hurwitz criterion, root-loci, Bodeplots and polar plots, Nyquist's criterion; Design of lead-lag compensators. Proportional, PI, PID controllers. Statevariable representation and analysis of control systems.
- 2. Microprocessors and Microcomputers:** PC organisation; CPU, instruction set, register set, timing diagram, programming, interrupts, memory interfacing, I/O interfacing, programmable peripheral devices.
- 3. Measurement and Instrumentation:** Error analysis; measurement of current, voltage, power, energy, power-factor, resistance, inductance, capacitance and frequency; bridge measurement. Signal conditioning circuit; Electronic measuring instruments: multimeter, CRO, digital voltmeter, frequency counter, Q-meter, spectrum-analyzer, distortion-meter. Transducers: thermocouple, thermistor, LVDT, strain-gauge, piezo-electric crystal.
- 4. Power Systems: Analysis and Control:** Steady-state performance of overhead transmission lines and cables; principles of active and reactive power transfer and distribution; per-unit quantities; bus admittance and impedance matrices; load flow; voltage control and power factor correction; economic operation; symmetrical components, analysis of symmetrical and unsymmetrical faults. Concept of system stability: swing curves and equal area criterion. Static VAR system. Basic concepts of HVDC transmission.
- 5. Power System Protection:** Principles of overcurrent, differential and distance protection. Concept of solid state relays. Circuit breakers.

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Computer aided protection: Introduction; line bus, generator, transformer protection; numeric relays and application of DSP to protection.

6. **Digital Communication:** Pulse code modulation (PCM), differential pulse code modulation (DPCM), delta modulation (DM), Digital modulation and demodulation schemes: amplitude, phase and frequency keying schemes (ASK, PSK, FSK). Error control coding: error detection and correction, linear block codes, convolution codes. Information measure and source coding. Data networks, 7-layer architecture.

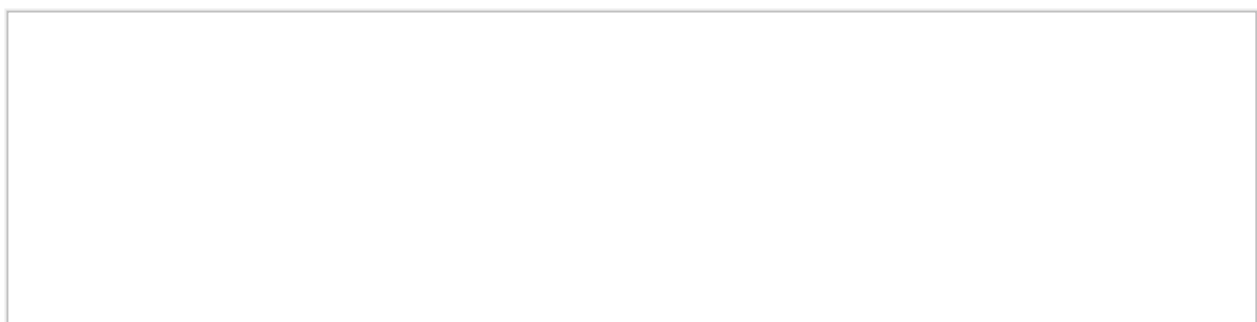
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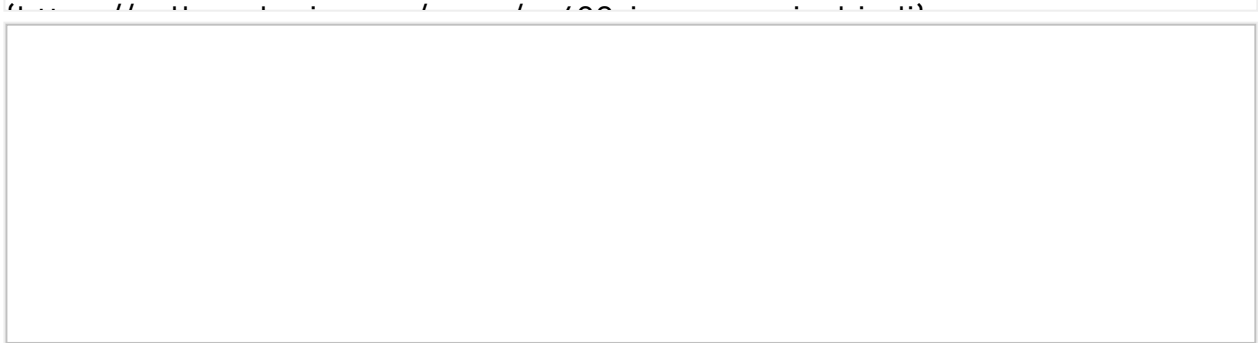
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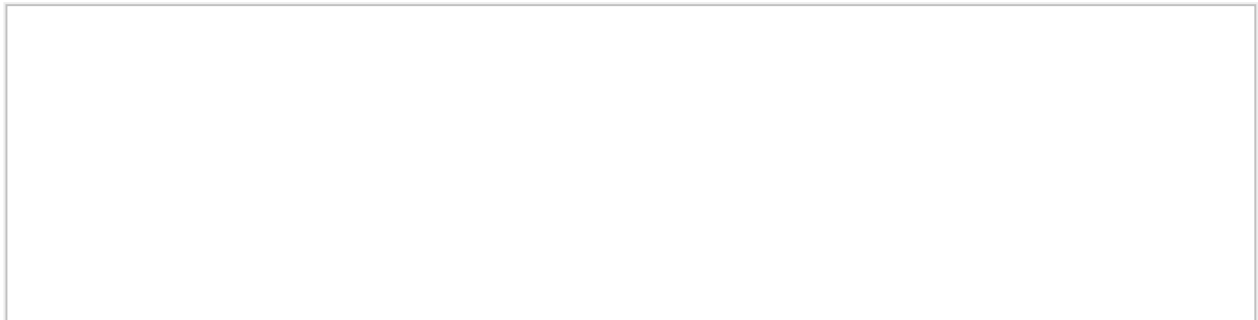
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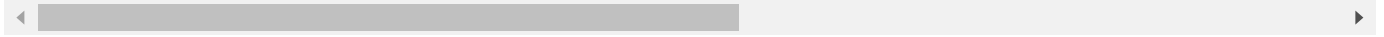


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