

Exam topics

1. Definitions: measurement, measurement method, measurement process, measurement result, measurement uncertainty, standard, measuring unit.
2. The measurement process
3. The measurand :classification, global quantities, first, second and third degree quantities
4. The measurement method: classification
5. Simultaneous 1:1 comparison
6. Simultaneous 1:n comparison
7. The measuring instrument
8. Metrological characteristics of the measuring instruments
9. The legal system of measuring units
10. Frequency standard: Cs
11. The absolute voltage standard and the Josephson standard
12. The conservation voltage standards
13. The absolute current standard
14. The absolute capacitance standard
15. The absolute resistance standard
16. Error types
17. Data processing – aggregation of errors
18. Voltage dividers (resistive, RC, capacitive)
19. Inductive voltage dividers (Kelvin Varley and the voltage transformer)
20. Current dividers (the shunt, the current transformer)
21. Attenuators
22. Instrumentation amplifiers – the main parameters
23. The chopper amplifier
24. Isolation amplifier (optocouplers and transformers)
25. Logarithmic amplifiers
26. Exponential amplifiers
27. Constant current compensator
28. Constant resistance compensator
29. Feussner compensator
30. Kelvin Varley compensator
31. Voltage measurements using deviation methods
32. Error sources for DC voltage measurements (SMRR, CMRR)
33. AC-DC converter for mean value
34. AC-DC converter for RMS value
35. AC-DC converter for peak value
36. DC current measurements (ammeter error, 4 terminal resistor, current to voltage converters)
37. AC current measurements (Hall, GMR)
38. DC power measurements (direct load voltage, direct load current)
39. AC power measurements (general considerations)
40. The method of 3 voltmeters
41. Thermal voltmeters (thermistor, thermocouple)
42. TDM based wattmeters
43. Hall effect based wattmeters
44. Digital multiplier based wattmeter
45. Line frequency power measurements
46. High frequency power measurements (directional couplers)
47. Thermistor based power meters