

AMERC

Electrical and Electronic Circuit Principles

Pre-requisite for
GMDSS Radio Maintenance Certificate
Electronic Navigation Equipment Maintenance Certificate

SYLLABUS

Safety Precautions:

High Voltages,
EM Radiation

Circuit Theory:

Application of Ohm's law to resistor networks
Derives and applies the concept of proportional voltage and current circuit analysis
Kirchoff's laws
Two current networks

Capacitors:

Charge in a stored capacitor
Charging via resistor from a constant voltage source
Charging from a constant current source
Equivalent capacitance and voltage across capacitors in series
Equivalent capacitance for capacitors in parallel

Magnetism:

Energy stored in an Inductor
Self and mutual inductance

Transformers:

Voltage, current and power relationship in ideal transformer
Transformer losses
Transformer as a matching device

Secondary Cells: (Lead Acid Batteries)

Voltage per cell on charge, idle and discharged
Specific Gravity during charge/discharge cycle
Ampere Hour capacity
Care and maintenance
Safety precautions

Decibels:

Expression of power and voltage gains/losses in decibels

Signal to Noise Ratio (SNR)

Semiconductor Applications:

Rectifier diodes
Zener diodes
SCR (Thyristor)
Bipolar transistors
Field effect transistors

D.C. Transients:

CR circuits
LR circuits
Time constant
Analysis (graphical) of CR and LR circuits

D.C. Restoration:

High and low level clamping to zero
High and low level clamping to a pre-determined d.c. level

Limiting and Squaring:

Diode limiting
Schmitt trigger circuits

A.C. Theory:

CR, LR and LCR in series and parallel
Resonance
Power factor
Q factor

Power Supplies:

Half wave, full wave bridge and voltage multiplier rectifier circuits
Voltages and voltage rating of diodes
Smoothing
Regulation
Switch mode power supplies – principles only

Amplifiers:

Bipolar and FET devices as switches
Bipolar and FET devices as linear amplifiers
Bipolar and FET devices as power amplifiers
Constant current generators
Calculate typical voltages and currents in:

- Practical linear circuits
- Practical switching circuits

Operational Amplifiers

- Inverting and non-inverting configurations
- Summing and difference amplifiers
- Use as an integrator

Oscillators:

Introduction to LC and RC sinusoidal oscillators
Square wave generators

Logic:**Combinational:**

AND, OR, NAND, NOR, EX-OR/NOR
Logic families: TTL, ECL and CMOS
Interfacing logic families

Sequential:

Synchronous and Asynchronous counters and registers

Digital:

Analogue to Digital (A to D) and Digital to Analogue (D to A) converters

Memory devices: RAM, ROM, EPROM, and EEPROM

Basic microprocessor applications

Display technologies

Measuring Instruments:

Principles and use of:

- Universal meter
- CRO
- Logic probes and logic pulsers

Effect of test instruments on circuits under test

Three Phase

(Not included in assessment but recommended for candidates without electrical/electronic background)

Star and Delta configuration

Power dissipation

Neutral current in four-line system