

Annex A to AMC/GM Part 147 - Module 3 Electrical fundamentals

CASA module Examinations subjects	CASA mech basics exams equavelant	CASA avionic basics exams equavelant
Module 3 Electrical fundamentals (B1 & B2)		
3.1 Electron theory		
Structure and distribution of electrical charges within atoms, molecules, ions, compounds;	Nil	QA
Molecular structure of conductors, semiconductors and insulators.	Nil	QA
3.2 Static electricity and conduction		
Static electricity and distribution of electrostatic charges;	Nil	QA
Electrostatic laws of attraction and repulsion;	Nil	QA
Units of charge, Coulomb's Law;	Nil	QA
Conduction of electricity in solids, liquids, gases and vacuum.	Nil	QA
3.3 Electrical terminology		
The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow, electron flow.	Nil	QA
3.4 Generation of electricity		
Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.	Nil	QA
3.5 DC sources of electricity		
Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other Alkaline cells;	BC	QA
Cells connected in series and parallel;	BC	QA
Internal resistance and its effect on a battery;	BC	QA
Construction, materials and operation of thermocouples;	Nil	QA
Operation of photo-cells.	Nil	ED
3.6 DC circuits		
Ohms Law, Kirchoff's Voltage and Current Laws;	Nil	QA
Calculations using the above laws to find resistance, voltage and current;	Nil	QA
Significance of the internal resistance of a supply.	Nil	QA
3.7 Resistance and resistor		
(a)		
Resistance and affecting factors;	Nil	QA
Specific resistance;	Nil	QA
Resistor colour code, values and tolerances, preferred values, wattage ratings;	Nil	QA
Resistors in series and parallel;	Nil	QA
Calculation of total resistance using series parallel and series parallel combinations;	Nil	QA

Operation and use of potentiometers and rheostats;	BC	QA
Operation of Wheatstone Bridge;	Nil	QA
(b)		
Positive and negative temperature coefficient conductance;	Nil	QA
Fixed resistors, stability, tolerance and limitations, methods of construction;	Nil	QA
Variable resistors, thermistors, voltage dependent resistors;	Nil	QA
Construction of potentiometers and rheostats;	Nil	QA
Construction of Wheatstone Bridge.	Nil	QA
3.8 Power		
Power, work and energy (kinetic and potential);	Nil	QA
Dissipation of power by a resistor;	Nil	QA
Power formula;	Nil	QA
Calculations involving power, work and energy.	Nil	QA
3.9 Capacitance and capacitor		
Operation and function of a capacitor;	Nil	QA
Factors affecting capacitance area of plates, distance between plates, number of plates, dielectric and dielectric constant, working voltage, voltage rating;	Nil	QA
Capacitor types, construction and function;	Nil	QA
Capacitor colour coding;	Nil	QA
Calculations of capacitance and voltage in series and parallel circuits;	Nil	QA
Exponential charge and discharge of a capacitor, time constants;	Nil	QA
Testing of capacitors.	Nil	QA
3.10 Magnetism		
(a)		
Theory of magnetism;	Nil	QA
Properties of a magnet;	Nil	QA
Action of a magnet suspended in the Earth's magnetic field;	Nil	QA
Magnetisation and demagnetisation;	Nil	QA
Magnetic shielding;	Nil	QA
Various types of magnetic material;	Nil	QA
Electromagnets construction and principles of operation;	Nil	QA
Hand clasp rules to determine: magnetic field around current carrying conductor.	Nil	QA
(b)		
Magneto-motive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, reluctance, saturation point, eddy currents, coercive force;	Nil	QA
Precautions for care and storage of magnets.	Nil	QA
3.11 Inductance and inductor		
Faraday's Law;	Nil	QA

Action of inducing a voltage in a conductor moving in a magnetic field;	Nil	QA
Induction principles;	Nil	QA
Effects of the following on the magnitude of an induced voltage: magnetic field strength, rate of change of flux, number of conductor turns;	Nil	QA
Mutual induction;	Nil	QA
The effect the rate of change of primary current and mutual inductance has on induced voltage;	Nil	QA
Factors affecting mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other;	Nil	QA
Lenz's Law and polarity determining rules;	Nil	QA
Back emf, self-induction;	Nil	QA
Saturation point;	Nil	QA
Principal uses of inductors.	Nil	QA
3.12 DC motor and generator theory		
Basic motor and generator theory;	BC	QA
Construction and purpose of components in DC generator;	BC	QA
Operation of, and factors affecting output and direction of, current flow in DC generators;	BC	QA
Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors;	BC	QA
Series wound, shunt wound and compound motors;	BC	EB
Starter generator construction.	Nil	EB
3.13 AC theory		
Sinusoidal waveform: phase, period, frequency, cycle;	Nil	ED
Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power;	Nil	ED
Triangular and square waves;	Nil	ED
Single and 3 phase principles.	Nil	ED
3.14 Resistive (R), Capacitive (C) and Inductive (L) Circuits		
Phase relationship of voltage and current in L, C and R circuits, parallel, series and series parallel;	Nil	QD
Power dissipation in L, C and R circuits;	Nil	QD
Impedance, phase angle, power factor and current calculations;	Nil	QD
True power, apparent power and reactive power calculations.	Nil	QD
3.15 Transformers		
Transformer construction principles and operation;	Nil	QD
Transformer losses and methods for overcoming them;	Nil	QD
Transformer action under load and no-load conditions;	Nil	QD
Power transfer, efficiency, polarity markings;	Nil	QD

Calculation of line and phase voltages and currents;	Nil	QD
Calculation of power in a 3 phase system;	Nil	QD
Primary and secondary current, voltage, turns ratio, power, efficiency;	Nil	QD
Autotransformers.	NIL	QD
3.16 Filters		
Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.	Nil	QD
3.17 AC generators		
Rotation of loop in a magnetic field and waveform produced;	Nil	QD
Operation and construction of revolving armature and revolving field type AC generators;	Nil	QD
Single phase, 2 phase and 3 phase alternators;	Nil	QD
Three phase star and delta connections advantages and uses;	Nil	QD
Permanent magnet generators.	Nil	QD
3.18 AC motors		
Construction, principles of operation and characteristics of:	Nil	QD
AC synchronous and induction motors both single and polyphase;	Nil	QD
Methods of speed control and direction of rotation;	Nil	QD
Methods of producing a rotating field: capacitor, inductor, shaded or split pole.	Nil	QD