Subject Name Solutions

4311101 – Winter 2024

Semester 1 Study Material

Detailed Solutions and Explanations

Question 1(a) [3 marks]

Define current, electric Power and energy.

Solution

Term	Definition
Current	The rate of flow of electric charge through a conductor (measured in amperes, A)
Electric Power	The rate at which electrical energy is transferred or consumed (measured in watts, W)
Energy	The capacity to do work, measured as power multiplied by time (measured in joules or watt-hours)

Mnemonic

"CPE: Charge-Per-second, Product-of-VI, Energy-over-time"

Question 1(b) [4 marks]

Explain the effect of temperature on the value of resistance of pure metal, alloys and insulators.

Solution

Material Type	Temperature Effect	Equation
Pure Metals	Resistance increases with temperature	$R_2 = R_1[1 + (T_2 - T_1)]$
Alloys	Slight increase with temperature (low)	$R_2 = R_1[1 + (T_2 - T_1)]$
Insulators	Resistance decreases with temperature	$R_2 = R_1 e\hat{}((1/T_2 - 1/T_1))$

where is temperature coefficient, T is temperature, and R is resistance

Mnemonic

"MAI: Metals Add, Alloys Increase-little, Insulators Invert"

Question 1(c) [7 marks]

State and explain KCL and KVL with examples.

Solution

Kirchhoff's Laws:

Law	Statement	Equation	Example Circuit
KCL	Sum of currents entering a node equals sum of currents leaving the node	=	`mermaid graph TD; A((Node)); I1-->A; I2-->A; A-->I3; A-->I4;`