

FOURTH ORDER EQUATION OF THE ELECTRIC CIRCUIT

LET R SERIES RESISTANCE

G SHUNT CONDUCTANCE

X SERIES REACTANCE

B SHUNT SUCCEPTANCE

Z TOTAL COMPLEX SERIES
IMPEDANCE

Y TOTAL SHUNT CONDUCTANCE

OHM $\dot{Z} = (k_4^0 R + k_4^1 X) + (k_4^2 G + k_4^3 B)$

SIEM $\dot{Y} = (k_4^0 G + k_4^1 B) + (k_4^2 R + k_4^3 X)$

CHARACTERISTIC IMPEDANCE

$$\dot{Z}_0 = \sqrt{\frac{\dot{Z}}{\dot{Y}}} \quad \text{OHMS}$$

PROPAGATION CONSTANT

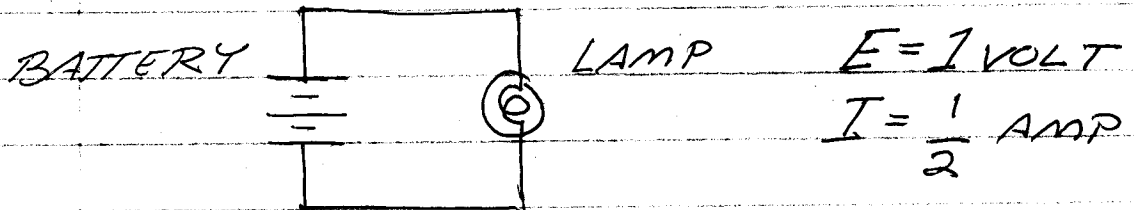
$$\gamma_0 = \sqrt{\dot{Z}\dot{Y}} \quad \text{NEPER} \cdot \text{RADIANS}$$

DIFFERENTIAL OPERATOR

$$k_4^n = +1^{+\frac{1}{4}} = \sqrt[4]{+1}$$

$$k_4^0 = 1, \quad k_4^1 = j, \quad k_4^2 = -1, \quad k_4^3 = -j$$

SIMPLE EXAMPLE, A
FLASHLITE:



(I) BATTERY, PRODUCING ENERGY

1) AT THE RATE $E \cdot I = 0.5 \text{ WATT}$

2) WITH NEGATIVE CONDUCTANCE $-G =$
 -0.5 SIEMENS

(II) LAMP, CONSUMING ENERGY

1) AT THE RATE $E \cdot I = -0.5 \text{ WATT}$

2) WITH A POSITIVE RESISTANCE $+R =$
 $+2.0 \text{ OHM}$

(III) CHARACTERISTIC IMPEDANCE
OF FLASHLITE

$$Z_0 = \sqrt{R/G} = \sqrt{2/0.5} = 2 \text{ OHM}$$

(IV) CHARACTERISTIC PROPAGATION
OF FLASHLITE

$$\gamma_0 = \sqrt{RG} = \sqrt{2 \times 0.5} = 1 \text{ NEPER}$$

(V) FLASHLITE IS SCALAR IN
THAT NO VARIATION WITH
RESPECT TO LENGTH NOR
VARIATION WITH RESPECT
TO TIME OF THE QUANTITIES
E, VOLTS & I, AMPERES

REF 1) SYMBOLIC REP. OF ALTERNATING
ELECTRIC WAVE, E.P. DOLLARD,

REF 2) SYMBOLIC REP. OF GENERALIZED ELECTRIC
WAVE, E.P. DOLLARD.

REPRESENTING ENERGY RETURN & STORAGE.

TABLE (2)

$$+k_1^1 = +j$$

$$+k_1^{-1} = k_1^3 = -j$$

$$+k_1^2 = -1$$

$$+k_1^{-2} = k_1^4 = -1$$

$$+k_1^3 = -j$$

$$+k_1^{-3} = k_1^1 = +j$$

$$+k_1^4 = +1$$

$$+k_1^{-4} = k_1^0 = +1$$

$$-k_1^1 = -j$$

$$-k_1^{-1} = k_1^1 = +j$$

$$-k_1^2 = +1$$

$$-k_1^{-2} = k_1^0 = +1$$

$$-k_1^3 = +j$$

$$-k_1^{-3} = k_1^3 = -j$$

$$-k_1^4 = -1$$

$$-k_1^{-4} = k_1^4 = -1$$

FORWARD ROTATION

REVERSE ROTATION