Systems Engineering

Formula Sheet

Please remove from the centre of this book during reading time.

You may keep this Formula Sheet.

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VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY
VICTORIA State Government

Electrical

<table>
<tr><td>resistors in series
$R_t = R_1 + R_2 + R_3 + \ldots$</td><td>capacitors in series
$\frac{1}{C_t} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \ldots$</td></tr>
<tr><td>resistors in parallel
$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$</td><td>capacitors in parallel
$C_t = C_1 + C_2 + C_3 + \ldots$</td></tr>
<tr><td>two resistors only, in parallel
$R_t = \frac{R_1 \times R_2}{R_1 + R_2}$</td><td>two capacitors only, in series
$C_t = \frac{C_1 \times C_2}{C_1 + C_2}$</td></tr>
<tr><td>$V = IR$</td><td rowspan="3">1 W h = 1 watt hour
= 1 watt of power expended over 1 hour
= 3600 joules</td></tr>
<tr><td>$P = VI$</td></tr>
<tr><td>$E = P \times t$</td></tr>
<tr><td>transformer
$\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s}$</td><td>$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$</td></tr>
<tr><td>$\text{frequency} = \frac{1}{\text{period}}$</td><td>$\text{efficiency}_{\text{total}} = \text{efficiency}_1 \times \text{efficiency}_2 \times \text{efficiency}_3 \times \ldots$</td></tr>
</table>

Mechanical

$\text{efficiency} = \dfrac{\text{useful energy output}}{\text{total energy input}}$	$\text{efficiency}_{\text{total}} = \text{efficiency}_1 \times \text{efficiency}_2 \times \text{efficiency}_3 \times \ldots$
$F = m \times a$	weight = mass × acceleration due to gravity
$E = P \times t$	$\text{power} = \dfrac{\text{work done}}{\text{time}}$
work done = power × time	work done = force in direction moved × distance
$\text{mechanical advantage} = \dfrac{\text{load}}{\text{effort}}$	$\text{pressure} = \dfrac{\text{force}}{\text{area}}$
effort force × distance = load force × distance	moment = force × perpendicular distance to pivot point
torque = twisting force × perpendicular distance to pivot point	
$\text{gear or pulley ratio} = \dfrac{\text{speed of driver (rpm)}}{\text{speed of driven (rpm)}}$	$\text{gear ratio} = \dfrac{\text{number of teeth on driven}}{\text{number of teeth on driver}}$
$\text{pulley ratio} = \dfrac{\text{diameter of driven}}{\text{diameter of driver}}$	$\text{velocity ratio} = \dfrac{\text{distance moved by effort}}{\text{distance moved by load}}$

General

acceleration due to gravity, $g = 9.8\ \text{m s}^{-2}$
area of circle = πr^2
circumference of circle = $2\pi r$