

# Important Digital Switching System Formulas PDF



## Formulas Examples with Units

### List of 15 Important Digital Switching System Formulas

#### 1) Average Switching Time per Stage Formula ↻

Formula

$$T_{st} = \frac{T_{cs} - T_{other}}{K}$$

Example with Units

$$0.081s = \frac{0.353s - 0.11s}{3}$$

Evaluate Formula ↻

#### 2) Equipment Utilization Factor Formula ↻

Formula

$$EUF = \frac{S}{T_{SE}}$$

Example

$$6 = \frac{42}{7}$$

Evaluate Formula ↻

#### 3) Instantaneous Resistance of Microphone Formula ↻

Formula

$$R_i = R_q - R_{max} \cdot \sin(\omega \cdot T)$$

Example with Units

$$26.6738\Omega = 1.68\Omega - 25\Omega \cdot \sin(25.5\text{rad/s} \cdot 30s)$$

Evaluate Formula ↻

#### 4) Maximum Variation Resistance by Carbon Granules Formula ↻

Formula

$$R_{max} = \frac{R_q - R_i}{\sin(\omega \cdot T)}$$

Example with Units

$$24.9962\Omega = \frac{1.68\Omega - 26.67\Omega}{\sin(25.5\text{rad/s} \cdot 30s)}$$

Evaluate Formula ↻

#### 5) Number of SE in Equivalent Multistage Formula ↻

Formula

$$S_{em} = \frac{S_{sw}}{SEAF}$$

Example

$$4.6713 = \frac{14}{2.997}$$

Evaluate Formula ↻

#### 6) Number of SE in Single Switch Formula ↻

Formula

$$S_{sw} = S_{em} \cdot SEAF$$

Example

$$13.996 = 4.67 \cdot 2.997$$

Evaluate Formula ↻



## 7) Number of SE when SC Fully Utilised Formula

Formula

$$S = T_{SE} \cdot EUF$$

Example

$$42 = 7 \cdot 6$$

Evaluate Formula 

## 8) Number of Switching Elements Formula

Formula

$$n_{sw} = \frac{C_{sw} - C_{ch} - C_c}{C_s}$$

Example

$$0.25 = \frac{29 - 26.05 - 2.45}{2}$$

Evaluate Formula 

## 9) Number of Switching Stage Formula

Formula

$$K = \frac{T_{cs} - T_{other}}{T_{st}}$$

Example with Units

$$3 = \frac{0.353s - 0.11s}{0.081s}$$

Evaluate Formula 

## 10) Power Ratio Formula

Formula

$$P_R = 20 \cdot \log_{10} \left( \frac{V_2}{V_1} \right)$$

Example with Units

$$20 = 20 \cdot \log_{10} \left( \frac{500v}{50v} \right)$$

Evaluate Formula 

## 11) Quiescent Resistance of Microphone Formula

Formula

$$R_q = R_i + R_{max} \cdot \sin(\omega \cdot T)$$

Example with Units

$$1.6762\Omega = 26.67\Omega + 25\Omega \cdot \sin(25.5\text{rad/s} \cdot 30s)$$

Evaluate Formula 

## 12) Sinusoidal Input Formula

Formula

$$V_{sin} = e_q \cdot 2 \cdot V$$

Example with Units

$$2.88 = 0.012 \cdot 2 \cdot 120v$$

Evaluate Formula 

## 13) Switching Element Advantage Factor Formula

Formula

$$SEAF = \frac{S_{sw}}{S_{em}}$$

Example

$$2.9979 = \frac{14}{4.67}$$

Evaluate Formula 

## 14) Theoretical Maximum Load Formula

Formula

$$N = \frac{2 \cdot SC}{TC}$$

Example

$$15 = \frac{2 \cdot 33.75}{4.5}$$

Evaluate Formula 



## 15) Total Number of SE in System Formula

Evaluate Formula 

Formula

$$T_{SE} = \frac{S}{EUF}$$

Example





$$7 = \frac{42}{6}$$



## Variables used in list of Digital Switching System Formulas above

- $C_C$  Cost of Common Control System
- $C_{ch}$  Cost of Common Hardware
- $C_S$  Cost per Switching Element
- $C_{sw}$  Cost of Switching System
- $e_q$  Quantization Error
- **EUF** Equipment Utilization Factor
- **K** Number of Switching Stage
- **N** Number of Subscriber Lines
- $n_{sw}$  Number of Switching Element
- $P_R$  Power Ratio
- $R_i$  Instantaneous Resistance (*Ohm*)
- $R_{max}$  Maximum Variation in Resistance (*Ohm*)
- $R_q$  Quiescent Resistance (*Ohm*)
- **S** SE when SC Fully Utilized
- $S_{em}$  Number of SE in Equivalent Multistage
- $S_{sw}$  Number of SE in Single Switch
- **SC** Switching Capacity
- **SEAF** Switching Element Advantage Factor
- **T** Time Period (*Second*)
- $T_{cs}$  Call Setup Time (*Second*)
- $T_{other}$  Time Required Other than Switching (*Second*)
- $T_{SE}$  Total Number of SE
- $T_{st}$  Average Switching Time per Stage (*Second*)
- **TC** Traffic Handling Capacity
- **V** Voltage (*Volt*)
- $V_1$  Voltage1 (*Volt*)
- $V_2$  Voltage2 (*Volt*)
- $V_{sin}$  Sinusoidal Input
- $\omega$  Angular Frequency (*Radian per Second*)

## Constants, Functions, Measurements used in list of Digital Switching System Formulas above

- **Functions:** **log10**,  $\log_{10}(\text{Number})$   
*The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.*
- **Functions:** **sin**,  $\sin(\text{Angle})$   
*Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.*
- **Measurement:** **Time** in Second (s)  
*Time Unit Conversion* 
- **Measurement:** **Electric Resistance** in Ohm ( $\Omega$ )  
*Electric Resistance Unit Conversion* 
- **Measurement:** **Electric Potential** in Volt (V)  
*Electric Potential Unit Conversion* 
- **Measurement:** **Angular Frequency** in Radian per Second (rad/s)  
*Angular Frequency Unit Conversion* 



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