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Digital Switching System Formulas

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List of 15 Digital Switching System Formulas

Digital Switching System 🡕

1) Average Switching Time per Stage 🡕

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

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

2) Equipment Utilization Factor 🡕

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

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

3) Instantaneous Resistance of Microphone 🡕

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

ex $$26.67385\Omega = 1.68\Omega - 25\Omega \cdot \sin(25.5 rad/s \cdot 30s)$$

4) Maximum Variation Resistance by Carbon Granules ⤤

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

ex $24.99615\Omega = \dfrac{1.68\Omega - 26.67\Omega}{\sin(25.5 \text{rad/s} \cdot 30\text{s})}$

5) Number of SE in Equivalent Multistage ⤤

fx $S_{em} = \dfrac{S_{sw}}{SEAF}$

ex $4.671338 = \dfrac{14}{2.997}$

6) Number of SE in Single Switch ⤤

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

ex $13.99599 = 4.67 \cdot 2.997$

7) Number of SE when SC Fully Utilised ⤤

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

ex $42 = 7 \cdot 6$

8) Number of Switching Elements ⤴

Open Calculator ⤴

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

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

9) Number of Switching Stage ⤴

Open Calculator ⤴

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

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

10) Power Ratio ⤴

Open Calculator ⤴

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

$$ex \quad 20 = 20 \cdot \log 10 \left(\frac{500V}{50V} \right)$$

11) Quiescent Resistance of Microphone ⤴

Open Calculator ⤴

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

$$ex \quad 1.676154\Omega = 26.67\Omega + 25\Omega \cdot \sin(25.5 rad/s \cdot 30s)$$

12) Sinusoidal Input ⤴

fx $\boxed{\mathrm{V_{sin}} = \mathrm{e_Q} \cdot 2 \cdot \mathrm{V}}$

Open Calculator ⤴

ex $\boxed{2.88 = 0.012 \cdot 2 \cdot 120\mathrm{V}}$

13) Switching Element Advantage Factor ⤴

fx $\boxed{\mathrm{SEAF} = \dfrac{\mathrm{S_{sw}}}{\mathrm{S_{em}}}}$

Open Calculator ⤴

ex $\boxed{2.997859 = \dfrac{14}{4.67}}$

14) Theoretical Maximum Load ⤴

fx $\boxed{\mathrm{N} = \dfrac{2 \cdot \mathrm{SC}}{\mathrm{TC}}}$

Open Calculator ⤴

ex $\boxed{15 = \dfrac{2 \cdot 33.75}{4.5}}$

15) Total Number of SE in System ⤴

fx $\boxed{\mathrm{T_{SE}} = \dfrac{\mathrm{S}}{\mathrm{EUF}}}$

Open Calculator ⤴

ex $\boxed{7 = \dfrac{42}{6}}$

Variables Used

- 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
- ω Angular Frequency *(Radian per Second)*

Constants, Functions, Measurements used

- Function: **log10**, log10(Number)
  Common logarithm function (base 10)

- Function: **sin**, sin(Angle)
  Trigonometric sine function

- Measurement: **Time** in Second (s)
  Time Unit Conversion 🔗

- Measurement: **Electric Resistance** in Ohm (Ω)
  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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