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# Telecommunication Traffic System Formulas

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# List of 22 Telecommunication Traffic System Formulas

## Telecommunication Traffic System

### 1) Availability

Open Calculator

fx $$A = \frac{u}{u + d}$$

ex $$0.699956 = \frac{15.98s}{15.98s + 6.85s}$$

### 2) Average Holding Time

Open Calculator

fx $$AHT = \frac{A_{avg} \cdot T}{n}$$

ex $$1.670007s = \frac{2.5 \cdot 30s}{44.91}$$

### 3) Average Number of Call

Open Calculator

fx $$n = \frac{A_{avg} \cdot T}{AHT}$$

ex $$44.91018 = \frac{2.5 \cdot 30s}{1.67s}$$

## 4) Average Occupancy

Open Calculator

fx $$A_{avg} = \frac{n \cdot AHT}{T}$$

ex $$2.49999 = \frac{44.91 \cdot 1.67s}{30s}$$

## 5) Average Poisson Call Arrival Rate

Open Calculator

fx $$\lambda = \frac{A_p}{T}$$

ex $$3.813333 = \frac{114.4}{30s}$$

## 6) Call Setup Time

Open Calculator

fx $$T_{cs} = T_{other} + K \cdot T_{st}$$

ex $$0.353s = 0.11s + 3 \cdot 0.081s$$

## 7) Cost Capacity Index

Open Calculator

fx $$C_{ci} = \frac{N \cdot SC}{C}$$

ex $$30.36893 = \frac{15 \cdot 33.75}{16.67}$$

## 8) Cost of Common Hardware

Open Calculator

$$C_{ch} = C_{sw} - (n_{sw} \cdot C_s) - C_c$$

$$26.05 = 29 - (0.25 \cdot 2) - 2.45$$

## 9) Cost of Switching System

Open Calculator

$$C_{sw} = n_{sw} \cdot C_s + C_{ch} + C_c$$

$$29 = 0.25 \cdot 2 + 26.05 + 2.45$$

## 10) Cost per Subscriber

Open Calculator

$$C = \frac{N \cdot SC}{C_{ci}}$$

$$16.6749 = \frac{15 \cdot 33.75}{30.36}$$

## 11) Downtime

Open Calculator

$$d = \frac{u - A \cdot u}{A}$$

$$6.848571s = \frac{15.98s - 0.70 \cdot 15.98s}{0.70}$$

## 12) Grade of Service

Open Calculator

$$\mathrm{GoS} = \frac{\mathrm{N_L}}{\mathrm{T_c}}$$

$$0.270004 = \frac{6.985}{25.87}$$

## 13) Number of Lost Call

Open Calculator

$$\mathrm{N_L} = \mathrm{T_c} \cdot \mathrm{GoS}$$

$$6.9849 = 25.87 \cdot 0.27$$

## 14) Poisson Arrival

Open Calculator

$$\mathrm{A_p} = \lambda \cdot \mathrm{T}$$

$$114.3 = 3.81 \cdot 30\mathrm{s}$$

## 15) Quantization Error

Open Calculator

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

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

## 16) Switching Capacity

Open Calculator

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

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

## 17) Time Required for Functions other than Switching

Open Calculator

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

$$0.11s = 0.353s - 3 \cdot 0.081s$$

## 18) Total Number of Offered Calls

Open Calculator

$$T_c = \frac{N_L}{GoS}$$

$$25.87037 = \frac{6.985}{0.27}$$

## 19) Traffic Handling Capability

Open Calculator

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

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

## 20) Trunk Occupancy

Open Calculator

fx $$\rho = A_o \cdot \frac{1 - GoS}{A_{avg}}$$

ex $$0.2482 = 0.85 \cdot \frac{1 - 0.27}{2.5}$$

## 21) Unavailability of System

Open Calculator

fx $$U = 1 - A$$

ex $$0.3 = 1 - 0.70$$

## 22) Uptime

Open Calculator

fx $$u = \frac{A \cdot d}{1 - A}$$

ex $$15.98333s = \frac{0.70 \cdot 6.85s}{1 - 0.70}$$

# Variables Used

- **A** Availability
- **$A_{avg}$** Average Occupancy
- **$A_o$** Occupancy
- **$A_p$** Poisson Arrival
- **AHT** Average Holding Time *(Second)*
- **C** Cost per Subscriber
- **$C_c$** Cost of Common Control System
- **$C_{ch}$** Cost of Common Hardware
- **$C_{ci}$** Cost Capacity Index
- **$C_s$** Cost per Switching Element
- **$C_{sw}$** Cost of Switching System
- **d** Downtime *(Second)*
- **$e_q$** Quantization Error
- **GoS** Grade of Service
- **K** Number of Switching Stage
- **n** Average Number of Calls
- **N** Number of Subscriber Lines
- **$N_L$** Number of Lost Calls
- **$n_{sw}$** Number of Switching Element
- **SC** Switching Capacity
- **T** Time Period *(Second)*
- **$T_c$** Total Number of Offered Calls

- $T_{cs}$ Call Setup Time *(Second)*
- $T_{other}$ Time Required Other than Switching *(Second)*
- $T_{st}$ Average Switching Time per Stage *(Second)*
- **TC** Traffic Handling Capacity
- **u** Uptime *(Second)*
- **U** Unavailability
- **V** Voltage *(Volt)*
- $V_{sin}$ Sinusoidal Input
- **λ** Average Poisson Call Arrival Rate
- **ρ** Trunk Occupancy

# Constants, Functions, Measurements used

- Measurement: **Time** in Second (s)
  *Time Unit Conversion*
- Measurement: **Electric Potential** in Volt (V)
  *Electric Potential Unit Conversion*

## Check other formula lists

- **Digital Switching System Formulas**
- **Telecommunication Traffic System Formulas**

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