Q. Evaluate the convolution of

$x(t) = u(t-1)$ and $h(t) = e^{-t} \cdot u(t)$

Answer: $y(t) = \begin{cases} 0 & t-1 < 0 \\ \int_0^{t-1} e^{-\tau} \cdot d\tau & t-1 > 0 \end{cases}$

Types of ~~Static~~ LTI System

Static LTI System

* $y(t) = x(t+2)$
  - → Linear (Independent of Shifting)
  - → Time Invariant (
  - → Not static, $y(0) = x(2)$
    (Present, Future)

* $y(t) = x(2t)$
  - → Linear
  - → Time variant. (Short not Scaling in TIV)
  - → Non Static ($x(1) = x(2)$)

* $y(t) = \sin[x(t)]$
  - → non linear system. (due to Sin)

* $y(t) = \int_{-\infty}^{t} x(\tau)\, d\tau$
  - → Dynamic System (Past value of input)

* $y(t) = 2\, x(t)$
  - → constant coefficient.
  - → Linear, Static, TIV.

$y(t) = K \cdot x(t)$ ..... → only one possibility of Static LTI.

$Y(s) = K \cdot X(s)$

$H(s) = \frac{Y(s)}{X(s)} = \frac{K\,X(s)}{X(s)} = K \xrightarrow{ILT} K\,\delta(t)$.

If Transfer fun^n is constant, then it is Static LTI

If any constant value, then this Static LTI.
else dynamic LTI System.

$h(t) = 5\,\delta(t-2)$

K — Impulse $t=2$

· This is dynamic LTI System.

$H(s) = 5 \cdot e^{-2s}$

Static LTI Property.

$H(s) = K$ ---→ Constant of Transfer fun^n.

↓

$h(t) = K \cdot \delta(t)$ ← Impulse Present at Origin, then SLTI
else Dynamic LTI.

Prob 1: $h(t) = 5\,\delta(t-2)$

↓ ← Impulse but at $t=2$, So DLTI.

$H(s) = 5 \cdot e^{-2s}$ ← Depends on frequency.

Prob 2: $h(t) = -2\,\delta(t)$ ← Static LTI System.

Prob 3: