Gate Assignment

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Download latex code from

https://github.com/ArunSiddardha/EE900/tree/main/Gate_assignment/Gate_Assignment.tex

GATE-EC 1997 Q.1.5

The Laplace Transform of $e^{\alpha t}cos(\alpha t)$

1) $\frac{s-\alpha}{(s-\alpha)^2+\alpha^2}$

2) $\frac{s+\alpha}{(s-\alpha)^2+\alpha^2}$

3) $\frac{1}{(s-\alpha)^2}$

4) None of these

Solution

let h(t) = $e^{\alpha t}cos(\alpha t)$
Taking Laplace transform for h(t)

$$H(s) = \int_0^\infty h(t)e^{-st}dt \tag{0.0.1}$$

$$H(s) = \int_0^\infty e^{\alpha t}cos(\alpha t)\ e^{-st}dt \tag{0.0.2}$$

$$H(s) = \int_0^\infty e^{-(st-\alpha t)}cos(\alpha t)dt \tag{0.0.3}$$

using Integration by parts

$$H(s) = \left[\frac{1}{a^2+(s-a)^2}e^{-(st-\alpha t)} ((a-s)cos(ax) + asin(ax))\right]_0^\infty \tag{0.0.4}$$

$$H(s) = 0 - (a-s)\frac{1}{a^2+(s-a)^2} \tag{0.0.5}$$

$$H(s) = \frac{s-a}{a^2+(s-a)^2} \tag{0.0.6}$$