GATE 2022-IN

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Question : 18

A signal $x(t)$ is band-limited between 100 Hz and 200 Hz. A signal $y(t)$ is related to $x(t)$ as follows:

$y(t) = x(2t - 5)$

The statement that is always true is

(A) $y(t)$ is band-limited between 50 Hz and 100 Hz
(B) $y(t)$ is band-limited between 100 Hz and 200 Hz
(C) $y(t)$ is band-limited between 200 Hz and 400 Hz
(D) $y(t)$ is not band-limited

(GATE ST 2022)

Solution:

$x(t)$ is band-limited to 100 Hz to 200 Hz
$y(t) = x(2t - 5)$
$x(t) \rightleftharpoons X(\omega)$
$x(2t) \rightleftharpoons \frac{1}{2}X\left(\frac{\omega}{2}\right)$
Time shifting will not change bandwidth,
So $x(2t - 5)$ will be band limited to 200 to 400 .