Speed of response

Supervision notes for Linear Systems (IB Engineering).
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- What constitutes “speed of response” of a system?
  (as referred to in the question)
  1. Time domain: Step response behaviour.

![Graph showing step response behaviour with fast and slow responses.]

The response time could be measured as the time it takes for the output to settle within a given ε of the input.

Q: Are we talking open or closed loop responses here?

2. Frequency domain: Following of an input frequency.
   Can the system follow high frequency inputs?

![Graph showing frequency response with different curves.]

Good “speed of response” can follow a high freq. input.
Not so good.

Now, how do these characterisations relate?

Think about this before moving on.
We want to relate our time domain considerations to the frequency domain. A step function can be written as a sum of sinusoids (Fourier series, or more precisely the Fourier Transform). This allows us to find the system output using the freq response.

The slow system will cut off more of the high freq components, which make up the quick change in the step -> slower time domain response.

Intuitively, "fast" systems must have high freq components.

Remember, when answering a question like this, to consider the context of the question. The definitions here are loose, maybe another definition is more appropriate. It may help to explicitly state your assumptions and work through their implications. Don't blindly memorise.
Q: Come up with some examples where each definition for “speed” is appropriate. Also come up with another slightly different definition.